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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

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Includes passenger and cargo air transport operations; and aircraft accidents.

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Includes aircraft simulation technology.

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07 AIRCRAFT PROPULSION AND POWER 3908

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

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For related information see also *09 Research and Support Facilities (Air).*

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20 SPACECRAFT PROPULSION AND POWER 3920

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

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Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

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Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

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Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE **4060**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **4060**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **4061**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **4062**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **4063**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **4063**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **4064**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **4065**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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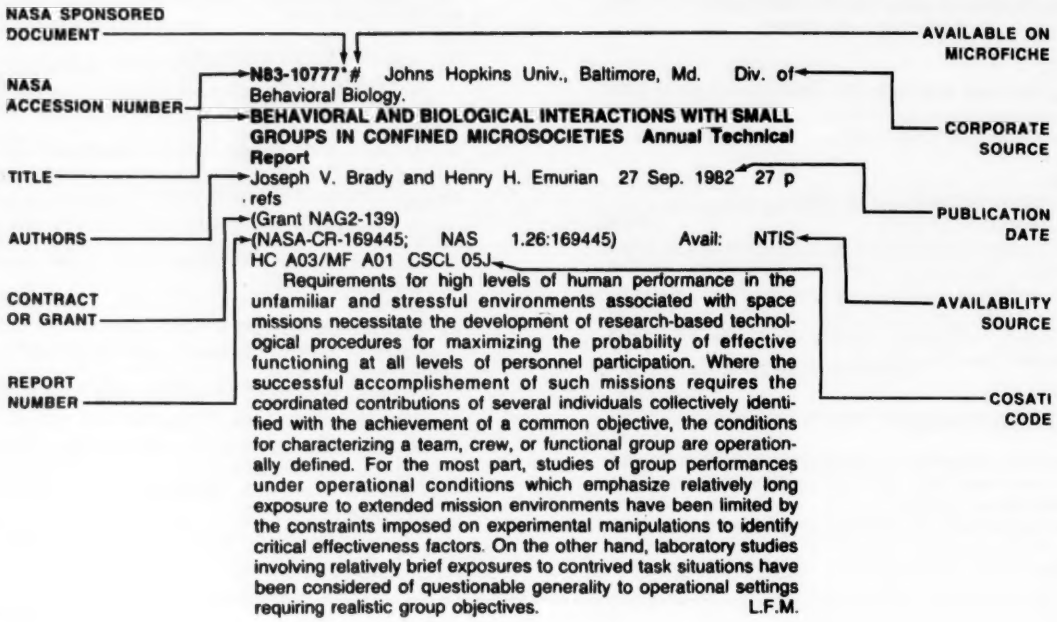
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N83-10777* # Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Grant NAG2-139)
REPORT NUMBER
(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS HC A03/MF A01 CSCL 05J
AVAILABILITY SOURCE
COSATI CODE
Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 24/DECEMBER 23, 1983

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N83-35992* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPLOSIVELY ACTIVATED EGRESS AREA Patent
Laurence J. Bement (LTV Aerospace Corp., Hampton, Va.) and James W. Bailey, inventors (to NASA) (LTV Aerospace Corp., Hampton, Va.) Issued 4 Oct. 1983 10 p Filed 30 Apr. 1981 Supersedes N81-29107 (19 - 20, p 2722) Sponsored by NASA (NASA-Case-LAR-12624-1; US-Patent-4,407,468; US-Patent-Appl-SN-259209; US-Patent-Class-244-137P; US-Patent-Class-89-1B; US-Patent-Class-102-378) Avail: US Patent and Trademark Office CSCL 01B

A lightweight, add on structure which employs linear shaped pyrotechnic charges to smoothly cut an airframe along an egress area periphery is provided. It compromises reaction surfaces attached to the exterior surface of the airframe's skin and is designed to restrict the skin deflection. That portion of the airframe within the egress area periphery is jettisoned. Retention surfaces and sealing walls are attached to the interior surface of the airframe's skin and are designed to shield the interior of the aircraft during detonation of the pyrotechnic charges.
Official Gazette of the U.S. Patent and Trademark Office

N83-35993# Army Aviation Research and Development Command, St. Louis, Mo. Directorate for Plans and Analysis.
HISTORICAL RESEARCH AND DEVELOPMENT INFLATION INDICES FOR ARMY FIXED AND ROTOR WINGED AIRCRAFT Annual Report
William Crosby Mar. 1983 25 p refs
(AD-A129317; USAAVRADCOM-TM-83-F-1) Avail: NTIS HC A02/MF A01 CSCL 05/1

This Technical Memorandum is a continuation of previous efforts to develop the necessary rationale and methodology needed in order to construct historical inflation indices, in the Research and Development (R&D) area, relative to Army aircraft. The R&D historical indices, and the sub-indices from which they are derived, are presented in the appendices to this report for the period FY68 through FY82. A computer program is utilized to make the necessary mathematical calculations. Data sources of this report were the Office of Personnel Management (OPM) and the Bureau of Labor Statistics (BLS). OPM supplied data on government salaries. BLS furnished data on industry salaries and thirteen (13) different materials. The computer program prints the R&D historical inflation indices and sub-indices by fiscal year as shown in Appendices A, C, D and E. Author (GRA)

N83-35994# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION, NO. 125
26 Sep. 1983 67 p Transl. into ENGLISH from various Russian articles
(JPRS-84397) Avail: NTIS HC A04

This serial report contains news items, abstracts and articles of scientific reports on aspects of transportation including civil aviation, rail systems. maritime and river fleets, and intersector network development. For individual titles, see N83-35995 through N83-35996.

N83-35995# Joint Publications Research Service, Arlington, Va.
MINISTER BUGAYEV ON TASKS, PROBLEMS FACING CIVIL AVIATION SECTOR
B. P. Bugayev *In its* USSR Rept.: Transportation, No. 125 (JPRS-84397) 26 Sep. 1983 p 1-8 Transl. into ENGLISH from Vozdushnny Transport (Moscow), 16 Jul. 1983 p 1-2 (For primary document see N83-35994 24-01)
Avail: NTIS HC A04

Improvement of work quality, responsible management of labor collectives, uncovering shortcomings, concern over young aviators, aeroflot's higher international authority, and improvement of work efficiency were discussed. B.G.

N83-35996# Joint Publications Research Service, Arlington, Va.
MINISTER BUGAYEV ON NEW CIVIL AVIATION CODE
B. P. Bugayev *In its* USSR Rept.: Transportation, No. 125 (JPRS-84397) 26 Sep. 1983 p 9-12 Transl. into ENGLISH from Izv. (Moscow), 1 Jun. 1983 p 2 (For primary document see N83-35994 24-01)
Avail: NTIS HC A04

The effects of the new U.S.S.R. civil aviation code were described. The role played by transportation in the national economic problems was examined. The airport network, passenger safety, legal liabilities, expansion of the airlines were also discussed. B.G.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N83-35997*# Kansas Univ., Lawrence. Flight Research Lab.
CALCULATION OF WING RESPONSE TO GUSTS AND BLAST WAVES WITH VORTEX LIFT EFFECT Contractor Report, Jun. 1981 - Dec. 1982
Der-Chang Chao and C. Edward Lan Oct. 1983 66 p refs
(Grant NAG1-75)
(NASA-CR-172232; NAS 1.26:172232; CRINC-FRL-467-1) Avail: NTIS HC A04/MF A01 CSCL 01A

A numerical study of the response of aircraft wings to atmospheric gusts and to nuclear explosions when flying at subsonic speeds is presented. The method is based upon unsteady quasi-vortex-lattice method, unsteady suction analogy, and Pade approximate. The calculated results, showing vortex lag effect, yield reasonable agreement with experimental data for incremental

lift on wings in gust penetration and due to nuclear blast waves.
Author

N83-35998*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PSEUDOSPECTRAL SOLUTION OF TWO-DIMENSIONAL GAS-DYNAMIC PROBLEMS Final Report
David A. Kopriva, Thomas A. Zang, M. D. Salas, and M. Y. Hussaini Sep. 1983 18 p refs
(Contract NAS1-17130)
(NASA-CR-172230; ICASE-83-51; NAS 1.26:172230) Avail: NTIS HC A02/MF A01 CSCL 01A

Chebyshev pseudospectral methods are used to compute two dimensional smooth compressible flows. Grid refinement tests show that spectral accuracy can be obtained. Filtering is not needed if resolution is sufficiently high and if boundary conditions are carefully prescribed.
Author

N83-35999*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A NUMERICAL STUDY OF THE STEADY SCALAR CONVECTIVE DIFFUSION EQUATION FOR SMALL VISCOSITY Final Report
Michael B. Giles and Milton E. Rose Sep. 1983 30 p refs
(Contracts NAS1-17070; NAS1-17130; Grant NAG3-9)
(NASA-CR-172231; ICASE-83-57; NAS 1.26:172231) Avail: NTIS HC A03/MF A01 CSCL 01A

A time-independent convection diffusion equation is studied by means of a compact finite difference scheme and numerical solutions are compared to the analytic inviscid solutions. The correct internal and external boundary layer behavior is observed, due to an inherent feature of the scheme which automatically produces upwind differencing in inviscid regions and the correct viscous behavior in viscous regions.
Author

N83-36000*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOW-SPEED AERODYNAMIC CHARACTERISTICS OF A HIGHLY SWEPT, UNTWISTED UNCAMBERED ARROW WING
Paul L. Coe, Jr., Scott O. Kjelgaard, and Garl L. Gentry, Jr. Oct. 1983 70 p refs
(NASA-TP-2176; NAS 1.60:2176) Avail: NTIS HC A04/MF A01 CSCL 01A

An investigation was conducted in the Langley 4- by 7-Meter Tunnel to provide a detailed study of wing pressure distributions and forces and moments acting on a highly swept arrow-wing model at low Mach numbers (0.25). A limited investigation of the effect of spoilers at several locations was also conducted. Analysis of the pressure data shows that for the configuration with undeflected leading edges, vortex separation occurs on the outboard wing panel for angles of attack on the order of only 3 deg, whereas conventional leading-edge separation occurs at a nondimensional semispan station of 0.654 for the same incidence angle. The pressure data further show that vortex separation exists at wing stations more inboard for angles of attack on the order of 7 deg and that these vortices move inboard and forward with increasing angle of attack. The force and moment data show the expected nonlinear increments in lift and pitching moment and the increased drag associated with the vortex separation. The pressure data and corresponding force and moment data confirm that deflecting the entire wing leading edge uniformly to 30 deg is effective in forestalling the onset of flow separation to angles of attack greater than 8.6 deg; however, the inboard portion of the leading edge is overdeflected. The investigation further identifies the contribution of the trailing-edge flap deflection to the leading-edge upwash fields.
Author

N83-36001# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aerodynamics and Airframe Branch.
STABILITY ANALYSIS OF THE COMPRESSIBLE, ADIABATIC SIMILAR BOUNDARY LAYER EQUATIONS (LOWER BRANCH) Final Report, May - Aug. 1980
G. R. Verma, S. J. Scherr, and W. L. Hankey Mar. 1983 56 p refs
(Grant AF-AFOSR-0150-80; AF Proj. 2307)
(AD-A129838; AFWAL-TR-83-3037) Avail: NTIS HC A04/MF A01 CSCL 20/4

In a previous report the authors analyzed the stability of the lower branch solutions of the incompressible (M sub infinity = O) Falkner-Skan boundary layers. There a perturbation analysis to these boundary layers was performed resulting in the Rayleigh stability equation. Eigen value solutions were obtained for the Rayleigh equation for different adverse pressure gradient (beta) values. All retarded flows were found to be unstable for a small range of frequencies with the amplification factor increasing as the extent of reversed flow increased. In this report they have entended that work by including the effect of Mach number M sub infinity on the stability of adiabatic (S sub W = O) Falker-Skan equations for beta = -.04, -.08, -.12, -.16 and -.19884. We found out that in all these cases as the Mach number M sub infinity increases the instability of flow decreases. In most of the cases the instability almost completely disappeared at M sub infinity = 3.
GRA

N83-36002# National Aerospace Lab., Amsterdam (Netherlands).
CORRELATION OF EXPERIMENTAL AND QUASI-3D THEORETICAL AIRLOADS ON THE OSCILLATING LANN SUPERCRITICAL WING MODEL Final Technical Report, Apr. - Dec. 1982
A. Steiginga and H. Houwink Wright-Patterson AFB, Ohio AFWAL May 1983 65 p refs
(Contract F33615-79-C-3030; Grant AF-AFOSR-0136-80; AF Proj. 2401)
(AD-A130550; AFWAL-TR-83-3050; NLR-TR-83003-U) Avail: NTIS HC A04/MF A01 CSCL 20/4

Correlation of theoretical and experimental unsteady airloads on an oscillating semi-span model of a transport-type supercritical wing (LANN Model) was conducted. The theoretical method is a quasi-3D method which combines 2D transonic small perturbation theory (LTRAN-NLR code) with 2D and 3D subsonic theory (Doublet-Lattice method). Parameters in this correlation are Mach number, frequency, mean angle of attack, and oscillation amplitude.
GRA

N83-36003# Naval Surface Weapons Center, White Oak, Md.
LASER DOPPLER VELOCIMETER MEASUREMENTS OF THE TWO-DIMENSIONAL BOUNDARY LAYERS ON A PROJECTILE SHAPE AT MACH 3 Final Report
Jeffrey L. Gorney, William J. Yanta, and Donald W. Ausherman Sep. 1982 59 p refs
(Contract MIPR-BRL-M12-82)
(AD-A130014; AD-F500161; NSWC/MP-82-430) Avail: NTIS HC A04/MF A01 CSCL 14/2

Two dimensional boundary layer velocity profiles, as well as pressure distributions, turbulence intensities, and Reynolds stresses were measured on a six-caliber secant-ogive model for angles of attack of 0 deg, 2 deg. Test conditions were a Reynolds number of 2.7 times 10 to the sixth feet, Mach number of 3.2, and a P of 20 psia.
GRA

N83-36004# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AERODYNAMICS OF ASYMMETRIC SABOT DISCARD Final Report
Edward M. Schmidt and Peter Plostins Jun. 1983 55 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A130011; AD-F300271; ARBRL-MR-03281) Avail: NTIS HC A04/MF A01 CSCL 19/4

Experimental results are presented which examine the pressure distributions upon projectiles during the portion of the launch cycle which involves strong aerodynamic interference between the flight body and sabot components. Particular attention is given to the simulation of asymmetric sabot discard geometries since these configurations result in transverse loadings upon the projectile. The pressure distribution in a given section of the projectile surface is shown to be strongly influenced only by the flow field associated with the sabot component facing that section. The basic

features of the flow are similar in both the symmetric and asymmetric cases. The experiment is compared with existing analytical models and recommendations for improvements are made. GRA

N83-36005# Aeronautical Research Associates of Princeton, Inc., N. J.
ASYMPTOTIC INVISCID THEORY OF LIFT ON SLENDER BODIES OF REVOLUTION Final Report, 15 Apr. 1982 - 14 Jan. 1983
John E. Yates Feb. 1983 33 p refs
(Contract N00014-82-C-0352; NR Proj. 052-733; RR0230101)
(AD-A129473; ARAP-493) Avail: NTIS HC A03/MF A01 CSCL 20/4

The viscous theory of lift on bodies of revolution developed under previous contract (ONR N00014-81-C-0240) is simplified for slender bodies of revolution. The resultant inviscid integral equation is solved in closed form for a prolate spheroidal body. An explicit representation of the eigenfunction is obtained and numerical results for the load distribution are compared with results of conventional slender body theory. The magnitude of the eigenfunction is estimated to be of order 1 by correlating with experimental data on the USS Akron. The qualitative features of the load distribution are in much better agreement with experimental data than the distribution obtained with the equivalent base area concept applied to conventional slender body. Author (GRA)

N83-36006# Lockheed-Georgia Co., Marietta.
COMBINED DIRECT/INVERSE THREE-DIMENSIONAL TRANSONIC WING DESIGN Final Report, May 1981 - Sep. 1982
Richard A. Weed, Leland A. Carlson, and William K. Anderson May 1983 101 p refs
(Contract N00167-81-C-0078)
(AD-A129573; LG83ER0060; DTNSRDC/ASED-CR-03-83) Avail: NTIS HC A06/MF A01 CSCL 20/4

A combined direct/inverse three dimensional transonic wing design method is presented. The method is built around the ZEBRA II transonic potential flow solution algorithm to provide a design method that is particularly suited for use on a vector computer. The development of a pilot design computer code and a baseline design/analysis code is described. Results are presented that verify the accuracy and consistency of the design method. Author (GRA)

N83-36007# Boston Univ., Mass. Center for Computational and Applied Dynamics.
FREE WAKE AERODYNAMIC ANALYSIS OF HELICOPTER ROTORS Final Report, 17 Oct. 1979 - 26 May 1983
Luigi Morino, Zaven Kaprielian, Jr., and Slobodan R. Sipcic 26 May 1983 99 p refs
(Contract DAAG29-80-C-0016)
(AD-A129710; CCAD-TR-83-01; ARO-16294.2-EG) Avail: NTIS HC A05/MF A01 CSCL 20/4

A formulation for the free wake analysis of helicopter rotors in incompressible potential flows is presented here. The formulation encompasses both the theory and its numerical implementation. For the case of a single-bladed rotor in hover, the formulation is validated by numerical results which are in good agreement with the generalized wake of Landdgrebe. Extension of the theory to compressible flows is also outlined. These results indicate that the formulation does not require any empirical assumption (such as the rate of contraction of the radius of the wake) in order to avoid numerical instabilities. To our knowledge, the results presented here are the first ones ever obtained not requiring any ad-hoc assumptions in order to avoid such problems.
Author (GRA)

N83-36008# Sandia Labs., Albuquerque, N. Mex.
AERODYNAMIC DESIGN OF A MIDSIZED VERTICAL-AXIS WIND TURBINE USING NATURAL LAMINAR-FLOW BLADE ELEMENTS
Paul C. Klimas and Dale E. Berg 1 Jun. 1983 10 p refs Presented at the 6th Biennial Wind Energy Conf., Minneapolis, 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-011829; CONF-830631-3) Avail: NTIS HC A02/MF A01

Natural laminar-flow (NLF) airfoils are those which can achieve significant extents of laminar flow (greater than or equal to 30% chord) solely through favorable pressure gradients. Studies showed that vertical-axis wind turbines (VAWTs) using NLF sections as blade elements have the potential of producing energy at a significantly lower cost (approx. = 20%) than turbines of current design. Sandia National Laboratories (SNL) is now in the process of procuring a blade set for its 17-m-diameter research turbine which will use NLF sections as blade elements. The design of this blade set is described. The blade set design began with the definition of a family of three approximately 50% chord NLF sections (15, 18, and 21% t/c). These definitions involved numerically establishing airfoil contours giving section characteristics anticipated to be favorable in the VAWT context and then screening these using a VAWT performance model. Field tests of the 15 and 18% t/c sections as elements on the SNL 5-m diameter research turbine were used to validate the predicted element performance and to establish the fact that laminar flow could be sustained in the VAWT environment. DOE

N83-36009# Sandia Labs., Albuquerque, N. Mex.
PRESSURE DISTRIBUTIONS ON AN OPERATING VERTICAL-AXIS WIND-TURBINE BLADE ELEMENT
R. E. Akins, P. C. Klimas, and R. H. Croll 1983 8 p refs Presented at the 6th Biennial Wind Energy Conf., Minneapolis, 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012315; SAND-83-1186C; CONF-830631-4) Avail: NTIS HC A02/MF A01

Efforts to validate aerodynamic models of vertical axis wind turbines were limited by a lack of appropriate measurements as stall begins to occur along the blade. In order to measure the forces acting on a blade through stall and in post stall, a blade was instrumented using flush mounted pressure transducers. Data were obtained on an appropriate range of turbine operating conditions. These data indicate that at high incident wind speeds, dynamic stall occurs on the upwind portion of the rotation. DOE

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N83-36010# Douglas Aircraft Co., Inc., Long Beach, Calif.
IMPROVED INTERIOR EMERGENCY LIGHTING STUDY Final Report, 30 Sep. 1982 - 31 May 1983
M. Teal, A. A. Amster, W. H. Shook, and M. M. Platte Atlantic City, N.J. FAA Sep. 1983 76 p refs
(Contract DTFA03-82-C-00055)
(DOT/FAA/CT-83/31; MDC-J9838) Avail: NTIS HC A05/MF A01

This is the final report on the Improved Interior Emergency Lighting Study. The purpose of this study was to formulate a detailed cost analysis of two emergency light and emergency exit sign concepts or systems in commercial transport aircraft for improved passenger evacuation in dense cabin smoke conditions. Eleven emergency lighting systems were initially identified as possible candidate concepts. Of these, two were selected for a detailed cost analysis. Both selected systems are proposed as supplements to the existing emergency lighting system. Cost estimates were prepared to implement these two concepts production of new aircraft or during retrofit of existing aircraft. These estimates are summarized. B.W.

N83-36011# Federal Aviation Administration, Washington, D.C.
ADVISORY CIRCULAR. CERTIFICATION OF TRANSPORT CATEGORY ROTORCRAFT
25 Oct. 1983 267 p

(FAA-AC-29-2) Avail: NTIS HC A12/MF A01

This circular covers FAA policy on methods of compliance with Part 29 of Subchapter C, Chapter 1, Title 14 of the Code of Federal Regulations, which contains the Airworthiness Standards for Transport Category Rotorcraft. Included are methods of compliance in the areas of basic design, ground tests, and flight tests. Based largely on precedents set during helicopter certification programs spanning the past 25 years. Policy contained in earlier correspondence among FAA Headquarters, the rotorcraft industry, and certificating regions was consolidated. Author

N83-36012# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

DEVELOPMENT OF A CONTINUOUS MODE SEQUENCING CONCEPT FOR EJECTION SEATS Final Report

Louis A. DAulerio Jan. 1983 21 p

(WF41400000)

(AD-A128966; NADC-83039-60) Avail: NTIS HC A02/MF A01 CSCL 01/3

The need to provide safe egress from aircraft during low altitude, high speed and adverse attitude ejections requires the development of highly sophisticated and complex escape systems. Traditionally, the operation of an ejection seat has relied on the functioning of pyrotechnic and mechanical devices which are activated based almost exclusively on timing considerations alone, with little or no inputs from actual environmental conditions. In order to provide greater ejection seat performance it is desirable to activate these devices based on accurate and comprehensive environmental data. This report presents an ejection seat event sequencing concept whereby seat subsystems are activated and deployed based on a detailed analysis of airspeed and altitude at the time of ejection. The analysis of this concept and the results of a computer study undertaken to estimate the possible performance improvements offered by this concept will also be presented. GRA

N83-36013# Federal Aviation Administration, Washington, D.C. Office of Civil Aviation Security.

THE EFFECTIVENESS OF THE CIVIL AVIATION SECURITY PROGRAM Semiannual Report, 1 Jul. - 31 Dec. 1982

7 Apr. 1983 45 p

(AD-A128687; DOT/FAA/ACS-82-17) Avail: NTIS HC A03/MF A01 CSCL 01/2

The report includes an analysis of the current threat against civil aviation along with information regarding hijacking attempts, security incidents, bomb threats, and passenger screening activity. It also summarizes ongoing activities to assure adequate protection of civil air commerce against hijacking/sabotage and related crimes, and other aspects of the Civil Aviation Security Program. GRA

N83-36014# McDonnell Aircraft Co., St. Louis, Mo.

LIGHTNING TESTS ON THE WC-130 RESEARCH AIRCRAFT Final Report, Oct. 1981 - Sep. 1982

W. G. Butters and K. S. Zeisel Wright-Patterson AFB, Ohio AFWAL Dec. 1982 43 p refs

(Contract F33615-80-C-3406)

(AD-A129141; AFWAL-TR-82-3093) Avail: NTIS HC A03/MF A01 CSCL 01/3

Lightning simulation ground tests were conducted on a WC-130 aircraft which had previously been used by the Air Force in a lightning characterization program to investigate the electromagnetic field environment experienced by aircraft near active thunderstorms. Two types of lightning simulation tests were conducted. One technique used a Marx generator connected directly to the aircraft as the system stimulus. The second technique used the generator to abruptly charge a long horizontal wire which radiates the isolated aircraft with an electromagnetic pulse. Induced voltages on two interior wire pair circuits were measured. GRA

N83-36015# Federal Aviation Agency, Atlantic City, N.J.

GENERAL AVIATION SAFETY RESEARCH ISSUES Final Report

Robert J. Ontiveros Jun. 1983 39 p refs

(AD-A130074; FAA-CT-83-6; LPN-FAA-184-341-500) Avail: NTIS HC A03/MF A01 CSCL 01/2

This report is a compilation of general aviation safety research issues extracted and summarized from recent studies conducted by the Federal Aviation Administration (FAA), other government agencies, and the aviation industry. It offers an overview of conclusions and recommendations that highlight current and future problem areas in general aviation. The report addresses the expressed needs as defined by these studies which counsel research and development relevant to the interrelationships of man, machine, and environment to effectively improve the general aviation safety record. GRA

N83-36016# New Mexico Univ., Albuquerque. Inst. for Engineering Research.

SELECTIVE AUTOMATIC FIRE EXTINGUISHER FOR CLASS A WITH NOTIFICATION (SAFE CAN), VOLUME 1 Final Report, May 1981 - Mar. 1983

Christopher W. Wilson, Thomas M. Trujillo, and Dennis Zallen Tyndall AFB, Fla. AFESC May 1983 82 p refs

(Contract F29601-81-C-0013; AF Proj. 2505)

(AD-A130484; AFESC/ESL-TR-83-07-VOL-1; NMERI-TA3-1-VOL-1) Avail: NTIS HC A05/MF A01 CSCL 13/12

Currently, fire protection in electronic and computer facilities is provided by full flooding Halon or water sprinkler systems. These systems are expensive and/or damaging to electronic equipment. An original, compact, portable, automatic extinguisher and alarm unit for local extinguishment, such as waste receptacles, is described. An acoustic receiver which detects the alarm and provides fire department notification is also described. Environmental, component, and system testing is discussed and test data presented. This report is divided into two volumes. Volume 1 consists of the test, and Volume 2 consists of appendices. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N83-36017# Arinc Research Corp., Annapolis, Md.

RELIABILITY OF NAVIGATION SYSTEMS Final Report

P. D. Blythe May 1983 33 p refs

(Contract DTFA01-80-C-10030)

(AD-A130059; FAA-ES-83-2; Rept-1378-01-7-3008) Avail: NTIS HC A03/MF A01 CSCL 17/7

This report examines reliability as it relates to navigation systems in the National Airspace System. Reliability measures are defined and are applied to VOR, Omega, Loran-C, and GPS. The reliability equations and the system descriptions are basic in nature and the fundamental concepts are illustrated by calculations. Author (GRA)

N83-36018# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

ATTITUDE AND HEADING REFERENCE SYSTEMS Final Report

20 May 1983 18 p refs Supersedes MTP-6-2-120

(AD-A130285; TOP-6-2-120; MTP-6-2-120) Avail: NTIS HC A02/MF A01 CSCL 01/4

This test operations procedure (top) presents test methods to evaluate the technical performance of heading reference systems that meet criteria specified in applicable required documents. New universal heading reference systems are continually being developed and improved to meet new and existing requirements, with an all weather capability, for military and commercial aircraft. The

heading reference system provides an accurate determination of aircraft heading relative to true north. This is accomplished by use of a magnetic compass and/or a gyro compass, depending on the region of operation. Engineers and other personnel engaged in testing and evaluating aircraft systems have developed certain procedures of testing over a long period of time. These procedures, properly used, can aid in determining the acceptability of heading reference systems for an intended use. The reference system must adhere to user (Government) and manufacturer's specification to be accepted. This TOP is limited to heading reference systems of the directional gyro type. GRA

N83-36019# Coast Guard, Washington, D.C. Office of Research and Development.
LORAN-C SIGNAL STABILITY STUDY: SAINT MARY'S RIVER Final Report, May 1980 - May 1982
R. J. Wenzel and D. C. Slagle Dec. 1982 175 p refs
(AD-A130609; USCG-D-43-82) Avail: NTIS HC A08/MF A01 CSCL 17/7

The Coast Guard operated an experimental 'Loran-C mini-chain' in the St. Mary's River, Michigan from the beginning of 1976 to the end of 1980. The impetus for the experiment was a Congressionally directed Winter Navigation Program and the Great Lakes and the St. Lawrence Seaway. Certain key stretches of these waterways, such as the St. Mary's River, have particularly stringent navigation requirements. The mini-chain experiment was an investigation to see if Loran-C could satisfy those requirements. At the same time, the Coast Guard had a mandate to investigate the suitability of Loran-C for use in restricted waterways (harbor and harbor entrance (HHE) areas) throughout the United States. Once the Great Lakes Loran-C chain became operational, the mini-chain was no longer required in the St. Mary's River. At the conclusion of the mini-chain experiment, the Coast Guard had the opportunity to explore the final untested concept of the HHE program; the so-called Supplemental LOP. This report documents the results of these tests and shows a Supplemented LOP is a viable concept but not necessary in the St. Mary's River. With the existing chain being controlled from a site in the St. Mary's River, 25 meter, 99.9% probability performance is possible. The report shows how this appears to be the 'best achievable' Loran-C performance due to a problem known as phase modulation. GRA

N83-36020# Sandia Labs., Albuquerque, N. Mex. Exploratory Systems Div.
WELLBORE INERTIAL NAVIGATION SYSTEM (WINS) SOFTWARE DEVELOPMENT AND TEST RESULTS
Ralph Wardlaw, Jr. Sep. 1982 74 p refs
(Contract DE-AC04-76DP-00789)
(DE83-000405; SAND-82-1954) Avail: NTIS HC A04/MF A01

The structure and operation of the real time software developed for the Wellbore Inertial Navigation System (WINS) application are described. The procedure and results of a field test held in a 7000 ft well are discussed. Calibration and instrumentation error compensation are outlined, as are design improvement areas requiring further test and development. Notes on Kalman filtering and complete program listings of the real time software are included. DOE

N83-36021# Transportation Systems Center, Cambridge, Mass.
NAVSTAR GPS (GLOBAL POSITIONING SYSTEM) SIMULATION AND ANALYSIS PROGRAM Interim Report, Oct. 1981 - Dec. 1982
Rudolph Kalafus, Norman Knable, John Kraemer, and Janis Vilcans May 1983 186 p refs
(PB83-216648; DOT-TSC-RSPA-83-2) Avail: NTIS HC A09/MF A01 CSCL 17G

The capability of the planned NAVSTAR Global Positioning System (GPS) to meet civil navigation requirements is assessed. When it becomes operational, NAVSTAR GPS will provide accurate two dimensional and three dimensional service to a wide spectrum of users. The quality of the service will depend on the availability of the satellite signals, the satellite geometrics, the timing accuracy of the signals, and the user receiver design. Ten specific issues are identified which were not resolved. These issues provide the focus for the effort. First, air, marine and land requirements are cited. Next, the approach is described, whereby a combination of analysis and receiver simulation is used to address the issues. Receiver design alternatives are then discussed, focusing on the resulting GDOP distributions. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-36022*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARISON OF ADVANCED TURBOPROP AND TURBOFAN AIRPLANES
Vicki S. Johnson Sep. 1983 30 p refs Presented at the AIAA Appl. Aerodyn. Conf., Danvers, Mass., 13-15 Jul. 1983
(NASA-TM-85692; NAS 1.15:85692; AIAA-Paper-83-1823) Avail: NTIS HC A03/MF A01 CSCL 01C

Results of a parametric study to determine the effects of design variables and penalties on the fuel efficiency of Mach 0.8, 125-passenger, advanced turboprop airplanes show that propeller-wing interference penalty has a major effect. Propeller tip speed has a minor effect, and could be decreased to alleviate the noise problem without significant effects on fuel efficiency. The anticipated noise levels produced by the propfan will require additional acoustical treatment for the fuselage; this additional weight can have a significant effect on fuel efficiency. The propfan advantage over an equivalent technology turbofan is strongly dependent on the interference penalty and acoustical treatment weight. Lowering the cruise Mach number to around 0.73 would result in greatly increased fuel efficiency. Author

N83-36023# Aeronautical Research Labs., Melbourne (Australia).
SEA KING HELICOPTER FLIGHT TRIALS
C. R. Guy and M. J. Williams Jan. 1983 61 p refs
(ARL-AERO-Note-415; AR-002-938) Avail: NTIS HC A04/MF A01

A program of flight trials carried out with a Sea King Mk. 50 helicopter is described. An outline is given of the aircraft instrumentation, the data acquisition system and the data analysis procedures. Results are presented for conditions of trimmed level flight together with typical examples of dynamic response tests, transition maneuvers and Doppler and cable hover tests. A summary of the flight test schedule and objectives is included to indicate the scope of the flight trials program. This program was designed to provide results for use in the validation of the Sea King Mk. 50 mathematical model and for more general use in helicopter behavior studies. Author

N83-36024# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
GUIDE FOR CONCEPTUAL HELICOPTER DESIGN M.S. Thesis
Stephen Glenn Kee Jun. 1983 123 p refs
(AD-A128974) Avail: NTIS HC A06/MF A01 CSCL 05/9

A conceptual helicopter design method utilizing closed form formulas and approximations from historical data is developed for use in a helicopter design course. The design manual is to be used for the conceptual design of a single main rotor, utility helicopter. The manual was written principally for use in AE4306-Helicopter Design. Author (GRA)

N83-36025# Army Aviation Engineering Flight Activity, Edwards AFB, Calif. Directorate for Development and Qualification.
AIRWORTHINESS AND FLIGHT CHARACTERISTICS (AFC) TEST OF YAH-64 ADVANCED ATTACK HELICOPTER, PROTOTYPE QUALIFICATION TEST-GOVERNMENT (PQT-G), PART 3 AND PRODUCTION VALIDATION TEST-GOVERNMENT

(PVT-G) FOR HANDBOOK VERIFICATION Final Report, 12 May - 19 Aug. 1982
Bartholomew D. Picasso, III, Gary T. Downs, Robert M. Buckanin, and Michael K. Herbst Oct. 1982 272 p refs
(AD-A130524; USAAEFA-80-17-3) Avail: NTIS HC A12/MF A01 CSCL 01/3

The Airworthiness and Flight Characteristics Test of the YAH-64 helicopter was conducted. Seventy flights and 70.4 productive hours were flown. Performance testing assessed the probability of meeting the production contract requirements and consisted of an evaluation of hover, takeoff, level flight, forward flight climb and autorotational descent performance. Handling qualities testing determined compliance with selected research and development contract requirements and included standard stability and control tests, an evaluation of slope landing characteristics and instrument flight capability. Additional tests included evaluation of an uprated engine and an external noise survey. The YAH-64 now meets the performance requirements of the system specification for the production program; the vertical climb and maximum level flight cruise speeds. Slope landing characteristics were satisfactory up to 9 degree lateral slopes and 10 degree longitudinal slopes. GRA

N83-36026# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHINA'S QIANG 5 ATTACK AIRCRAFT
A. Ba 15 Jun. 1983 12 p Transl. into ENGLISH from Conmilit (China), v. 6, no. 11, issue 74, 1 Jan. 1983 p 36-39
(AD-A130117; FTD-ID(RS)T-0458-83) Avail: NTIS HC A02/MF A01 CSCL 01/3

Mainland Chinese military aircraft production is reviewed. The Qiang 5 attack aircraft and the Jian 6 fighter aircraft are discussed. Technical assistance from other countries is also discussed. N.W.

N83-36027# Sikorsky Aircraft, Stratford, Conn.
MODEL HH-53 HELICOPTER, DURABILITY AND DAMAGE TOLERANCE ASSESSMENT REPORT SUBMITTAL Monthly Status Letter
13 May 1983 6 p
(Grant F09603-81-G-1808)
(AD-A129255; SEL-7867) Avail: NTIS HC A02/MF A01 CSCL 01/3

Progress continued this month on the NASTRAN model of the forward cabin. Some program slippage was experienced in both the mass distribution and updating cabin stiffness. The transmission and sponson geometry definition was reassigned to the CAD group and new commitments from the weights group were obtained. The program should be back on schedule by April 15. Screening of sensitive dynamic components has also been started. Overall expenditures are about 18% of budget at this point. Although light, the charges are expected to rise as the NASTRAN model of the aft fuselage is generated. This will have to be a complete new model unlike the forward cabin which is a modified CH-53E model. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N83-36028*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF LEAD-AIRCRAFT GROUND-SPEED ON SELF-SPACING PERFORMANCE USING A COCKPIT DISPLAY OF TRAFFIC INFORMATION
James R. Kelly Oct. 1983 50 p refs
(NASA-TP-2194; L-15402; NAS 1.60:2194) Avail: NTIS HC A03/MF A01 CSCL 01D

A simulator investigation was conducted to determine the effect of the lead-aircraft ground-speed quantization level on self-spacing performance using a Cockpit Display of Traffic Information (CDTI). The study utilized a simulator employing cathode-ray tubes for the primary flight and navigation displays and highly augmented flight control modes. The pilot's task was to follow, and self-space on, a lead aircraft which was performing an idle-thrust profile descent to an instrument landing system (ILS) approach and landing. The spacing requirement was specified in terms of both a minimum distance and a time interval. The results indicate that the ground-speed quantization level, lead-aircraft scenario, and pilot technique had a significant effect on self-spacing performance. However, the ground-speed quantization level only had a significant effect on the performance when the lead aircraft flew a fast final approach. Author

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-36029* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR IMPROVING THE FUEL EFFICIENCY OF A GAS TURBINE ENGINE Patent
George A. Coffinberry, inventor (to NASA) (GE, Cincinnati) Issued 20 Sep. 1983 7 p Filed 20 Mar. 1980 Supersedes N83-14130 (21 - 05, p 0622) Sponsored by NASA
(US-Patent-LEW-13142-1; US-Patent-4,404,793;
US-Patent-Appl-SN-132364; US-Patent-Class-60-39.07) Avail: US Patent and Trademark Office CSCL 21E

An energy recovery system is provided for an aircraft gas turbine engine of the type in which some of the pneumatic energy developed by the engine is made available to support systems such as an environmental control system. In one such energy recovery system, some of the pneumatic energy made available to but not utilized by the support system is utilized to heat the engine fuel immediately prior to the consumption of the fuel by the engine. Some of the recovered energy may also be utilized to heat the fuel in the fuel tanks. Provision is made for multiengine applications wherein energy recovered from one engine may be utilized by another one of the engines or systems associated therewith.
Official Gazette of the U.S. Patent and Trademark Office

N83-36030 Rensselaer Polytechnic Inst., Troy, N. Y.
STRUCTURAL DYNAMICS ANALYSIS FOR TURBOMACHINERY BLADED DISKS Ph.D. Thesis
Naim Abdel Majeed Khader 1982 137 p
Avail: Univ. Microfilms Order No. DA8303069

The structural dynamics problem of a bladed disk with 24 hollow titanium blades is investigated. This design is used for the Aircraft Energy Efficient Engine. In the analysis, in addition to disk flexibility, shaft and bearing flexibilities are accounted for by considering rigid disk translations in the rotor plane and rigid disk rotations with respect to the same plane. The analysis include not only the out-of-plane displacements, but also the radial and tangential ones. These displacements are expressed in terms of time-dependent generalized coordinates and the nonrotating mode shapes obtained from finite element analysis with the disk hub fixed in space. Classical Lagrangian approach is used which couples the motion of a rigid bladed disk mounted on a rotating flexible shaft with the motion of a flexible bladed disk. Using the appropriate transformations between fixed and rotating coordinate systems, Lagrangian technique results in a system of second order differential equations with constant coefficients. The problem is of small size which is easily solved by the available computer

subroutines to obtain the frequencies and mode shapes for the rotating bladed disk assembly. Dissert. Abstr.

N83-36031*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MULTI-FUEL ROTARY ENGINE FOR GENERAL AVIATION AIRCRAFT

Charles Jones (Curtiss-Wright Corp.), David R. Ellis (Cessna Aircraft Co.), and Phillip R. Meng 27 Jun. 1983 86 p refs

(NASA-TM-85428; NAS 1.15:85428) Avail: NTIS HC A05/MF A01 CSCL 21E

Design studies, conducted for NASA, of Advanced Multi-fuel General Aviation and Commuter Aircraft Rotary Stratified Charge Engines are summarized. Conceptual design studies of an advanced engine sized to provide 186/250 shaft KW/HP under cruise conditions at 7620/25,000 m/ft. altitude were performed. Relevant engine development background covering both prior and recent engine test results of the direct injected unthrottled rotary engine technology, including the capability to interchangeably operate on gasoline, diesel fuel, kerosene, or aviation jet fuel, are presented and related to growth predictions. Aircraft studies, using these resultant growth engines, define anticipated system effects of the performance and power density improvements for both single engine and twin engine airplanes. The calculated results indicate superior system performance and 30 to 35% fuel economy improvement for the Rotary-engine airplanes as compared to equivalent airframe concept designs with current baseline engines. The research and technology activities required to attain the projected engine performance levels are also discussed. Author

N83-36032# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.

FLOW PROBLEMS IN TURBOMACHINES Annual Report, 1 Mar. 1982 - 28 Feb. 1983

Thomas C. Adamson, Jr. and Arthur F. Messiter 15 Apr. 1983 43 p refs

(Contract N00014-79-C-0285; NR Proj. 094-395; RR0240301)

(AD-A128675; AR-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

A brief discussion is given of the work done on the three problems studied during the period covered by this report. The problems considered are: (1) transonic flow through heavily loaded cascades, (2) transonic flow through a three dimensional compressor rotor, and (3) supersonic flow with a turbulent boundary layer at a ramp. Author (GRA)

N83-36033# Solar Turbines International, San Diego, Calif.

MID AND HIGH TEMPERATURE ROTOR PROGRAM FOR A 30 kW GAS TURBINE GENERATOR SET Final Technical Report

C. Rodgers and William D. Treece Dec. 1982 76 p refs

(Contract DAAK70-80-C-0152)

(AD-A129780; MERADCOM-82472; ERR-0287) Avail: NTIS HC A05/MF A01 CSCL 21/5

The objective of this program was the advancement of small radial inflow turbine technology in the area of operation at higher turbine inlet gas temperatures. A two-phase program was structured. In the first phase, two mid-temperature range 4.50-inch tip diameter radial inflow turbine rotors, were designed for a 30-kW gas turbine with a maximum turbine inlet nozzle temperature of 2200 F. One rotor was internally air-cooled and the other conduction-cooled in a monorotor (integral turbine and compressor) arrangement. On the basis of performance, structural and cost analyses, the monorotor arrangement was selected for continued development evaluation. A ceramic high temperature rotor was also studied for operation at a maximum turbine inlet nozzle temperature of 2600 F. Estimated failure probability for this high temperature rotor study was too high to warrant continuation. GRA

N83-36034# Detroit Diesel Allison, Indianapolis, Ind.

ADVANCED DIGITAL CONTROLLER DEVELOPMENT PROGRAM, TASK 1 Interim Report, 1 Sep. 1979 - 30 Sep. 1980

Joseph H. Hunter Wright-Patterson AFB, Ohio AFWAL Jul. 1982 76 p

(Contract F33657-79-C-0728; AF Proj. 3066)

(AD-A129269; AFWAL-TR-82-2047; DDA-EDR-10431) Avail: NTIS HC A05/MF A01 CSCL 21/5

The objective of this program phase was to develop the specification for a digital controller. This controller would have sufficient computing and I/O capability to control a variable cycle (VCE) single spool (e.g., GMA 200 ATEGG) or two spool (e.g., GMA200 JTDE) configuration. Provision has been made for seven controlled variables. These are: two fuel flows, variable compressor and turbine geometry, two cooling bleed flows, and variable nozzle area. A multivariate control logic structure was selected. Power commands, mode, and ambient conditions are used to estimate the equilibrium operating point. These schedules will then be adjusted to match the engine characteristics using an adaptive control algorithm. Optimal paths between operating points will be computed by a trajectory generator module. A proportional regulator is designed to track small perturbation from this nominal path. The design concept for a digital controller capable of implementing this control logic was developed. This required a specification of the GMA200 fuel control system with particular emphasis on the controller interface. Trade studies were identified and their impact on the control hardware presented. These included actuator selection, fuel system selection, and airflow measurement techniques. Timing and sizing studies were completed. This resulted in the selection of a bit-slice processor (an Am 2901) with 28K EPROM/RAM. GRA

N83-36035# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

NUMERICAL MODELLING OF RAMJET COMBUSTORS Final Report, Oct. 1981 - Aug. 1982

Warren H. Harch Feb. 1983 66 p refs

(AF Proj. 2308)

(AD-A129631; AFWAL-TR-82-2113) Avail: NTIS HC A04/MF A01 CSCL 21/5

The present work deals with development of computer codes for modelling of gas turbine combustors to ramjet combustor configurations. In particular, the STARPIC code of Lilley and Rhode has been expanded to include reacting compressible flows. Author (GRA)

N83-36036# Sundstrand Aviation-Rockford, Ill.

IMPROVEMENTS IN F-16 ENGINE RESTART CAPABILITY WITH A SIPU (SUPER INTEGRATED POWER UNIT) Final Report, Dec. 1981 - Oct. 1982

W. Glen Smith and Richard J. Fandel Wright-Patterson AFB, Ohio AFWAL Dec. 1982 42 p

(Contract F33615-82-M-2220; AF Proj. 3145)

(AD-A129578; AFWAL-TR-82-2118) Avail: NTIS HC A03/MF A01 CSCL 01/3

The F-16 main engine inflight restart capability would be greatly enhanced by utilizing a Super Integrated Power Unit (SIPU). Because the available starter power remains constant at all altitudes, the engine can be motored at relatively high rotative speeds, providing for rapid acceleration to a self sustaining condition after reflight. This reduced start time plus a multiple start capability, reduces altitude loss and increases safety during combat. The SIPU concept expands the airstart window and allows the pilot to assume a best range flight attitude which increases both time and range by up to 35% in the event the engine is not able to start. Author (GRA)

N83-36399# Mitsubishi Heavy-Industries Ltd., Nagoya (Japan). Engine Dept.

DEVELOPMENT OF HIGH LOADING, HIGH EFFICIENCY AXIAL FLOW TURBINE

Kenjiro Takeshima, Yoshihito Tonomura, Tomohiko Satoo (Takasago Inst.), Hiroyuki Nouse (National Aerospace Lab., Tokyo), Mitsuhiro Minoda (National Aerospace Lab., Tokyo), and Kitao Takahara (National Aerospace Lab., Tokyo) *In* Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1983 p 91-103 refs Original language document was announced as A82-47069

(For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N83-36037# Air Force Academy, Colo.
OPTIMAL PERIODIC CONTROL Final Report, Oct. 1980 - Dec. 1982
Richard T. Evans May 1983 30 p refs
(AF Proj. 2305)
(AD-A130114; FJSRL-TR-83-0005) Avail: NTIS HC A03/MF A01 CSCL 01/3

The stated objective of this research was to develop the theory and computational technique for optimizing the flight path of an aircraft with respect to fuel consumption (maximize range for a given amount of fuel) during the cruise segment of flight. It then was intended to apply these tools to a point mass model of an aircraft and determine a locally optimizing cyclic cruise flight path in a proof of principle demonstration. Their are numerous potential applications for this research. The more obvious Air Force benefits include: extend the range of an air vehicle with a fixed amount of fuel; reduce its fuel requirements for a given range hereby increasing its load capability; and increase its endurance allowing it to remain aloft longer. The improvements of periodic cruise flight paths appear to be most suited for remotely piloted aircraft or cruise missile type applications. However, in many emergency or back-up operations, it also would be quite feasible for manned systems. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N83-36038*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
SOME ASPECTS OF WIND TUNNEL MAGNETIC SUSPENSION SYSTEMS WITH SPECIAL APPLICATION AT LARGE PHYSICAL SCALES Report, Jul. 1981 - Jul. 1982
C. P. Britcher Hampton, Va. NASA. Langley Research Center Sep. 1983 333 p refs
(Grant NsG-7523)
(NASA-CR-172154; NAS 1.26:172154) Avail: NTIS HC A15/MF A01 CSCL 14E

Wind tunnel magnetic suspension and balance systems (MSBSs) have so far failed to find application at the large physical scales necessary for the majority of aerodynamic testing. Three areas of technology relevant to such application are investigated. Two variants of the Spanwise Magnet roll torque generation scheme are studied. Spanwise Permanent Magnets are shown to be practical and are experimentally demonstrated. Extensive computations of the performance of the Spanwise Iron Magnet scheme indicate powerful capability, limited principally be electromagnet technology. Aerodynamic testing at extreme attitudes is shown to be practical in relatively conventional MSBSs. Preliminary operation of the MSBS over a wide range of angles of attack is demonstrated. The impact of a requirement for highly reliable operation on the overall architecture of Large MSBSs is studied and it is concluded that system cost and complexity need not be seriously increased. S.L.

N83-36039*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPANDED OPERATIONAL CAPABILITIES OF THE LANGLEY MACH 7 SCRAMJET TEST FACILITY
Scott R. Thomas and Robert W. Guy Oct. 1983 74 p refs
(NASA-TP-2186; L-15565; NAS 1.60:2186) Avail: NTIS HC A04/MF A01 CSCL 14B

An experimental research program conducted to expand the operational capabilities of the NASA Langley Mach 7 Scramjet Test Facility is described. Previous scramjet testing in this facility was limited to a single simulated flight condition of Mach 6.9 at an altitude of 115,300 ft. The arc heater research demonstrates the potential of the facility for scramjet testing at simulated flight conditions from Mach 4 (at altitudes from 77,000 to 114,000 ft) to Mach 7 (at latitudes from 108,000 to 149,000 ft). Arc heater electrical characteristics, operational problems, measurements of nitrogen oxide contaminants, and total-temperature profiles are discussed. Author

N83-36040# BDM Corp., McLean, Va.
THE EFFECTS OF WEATHER ON RAPID RUNWAY REPAIR, VOLUME 1 Final Report, 30 Jun. - 5 Nov. 1982
J. M. Whitehead, M. D. Hoffman, P. G. Potter, C. P. Neuswanger, and M. M. Wilding Tyndall AFB, Fla. Air Force Engineering and Services Center. May 1983 215 p refs 2 Vol.
(Contract F08635-80-C-0206; AF Proj. 2621)
(AD-A130409; BDM/W-82-592-TR-Vol-1; AFESC/ESL-TR-82-41-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 01/5

This technical report is divided into two volumes. Volume 1 contains the technical analysis and weather effects on RRR process, while Appendix A, Weather Data, is published as Volume 2 because of its size. This report presents the results of a study to identify the effects of weather on Rapid Runway Repair (RRR). There are two major components of the study. The first characterizes the aspects of weather that affect RRR, by area for Korea, Europe, and England. Graphs present data on temperature, precipitation, visibility, wind, and humidity. The second component studies the effects of weather on the RRR process. The process is divided into activities, with associated efficiencies under various weather conditions. Values for the efficiencies are developed from military and industrial data. The two components are combined with a critical path analysis of several RRR procedures. The report identifies potential solutions to some weather-related problems, and make recommendations for further study. GRA

N83-36041*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PILOTED SIMULATOR INVESTIGATION OF SIDE-STICK CONTROLLER/STABILITY AND CONTROL AUGMENTATION SYSTEM REQUIREMENTS FOR HELICOPTER VISUAL FLIGHT TASKS
Kenneth H. Landis, Philip J. Dunford, Edwin W. Aiken, and Kathryn B. Hilbert May 1983 16 p refs Presented at the 39th Ann. Forum of the Am. Helicopter Soc., St. Louis, May 1983 Prepared in cooperation with Boeing Vertol Co., Philadelphia
(Contract NAS2-10880)
(NASA-CR-172852; NAS 1.26:172852; AD-A129833) Avail: NTIS HC A02/MF A01 CSCL 01C

A piloted simulator experiment was conducted to assess the effects of side-stick controller characteristics and level of stability and control augmentation on handling qualities for several low-altitude control tasks. Visual flight tasks were simulated using four-window computer-generated imagery depicting either a nap-of-the-Earth course or a runway with obstacles positioned to provide a slalom course. Both low speed and forward flight control laws were implemented, and a method for automatically switching control modes was developed. Variations in force-deflection characteristics and the number of axes controlled through an integrated side-stick were investigated. With high levels of stability and control augmentation, a four-axis controller with small-

deflection in all four axes achieved satisfactory handling qualities for low-speed tasks. GRA

N83-36042# Lea (N. D.) and Associates, Inc., Washington, D.C.
ASSESSMENT OF HOUSTON AIRPORT WEDWAY AUTOMATED TRANSIT SYSTEM Final Report
D. Muotoh, D. Dunoye, H. Moore, and W. Scott Apr. 1983 202 p refs Prepared in cooperation with Elliott (Dennis) and Associates, Inc., Arlington, Tex.
(Contract DTUM60-81-C-71089)
(PB83-210443; UMTA-IT-06-0248-83-2) Avail: NTIS HC A10/MF A01 CSCL 01E

This report presents the results of an assessment of the WEDway Automated Transit System installed at the Houston Intercontinental Airport in Houston, Texas. Included in this assessment report are a system description, a technical subsystems review and evaluation, an assessment of system performance and cost, and implementation history. During the assessment, the system was measured on the requirements for urban transit application. Information and data presented were collected through a comprehensive process involving literature surveys, interviews with airport and manufacturer's personnel, review of operating and maintenance logs, and a site visit. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N83-36043*# North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.
CALCULATIONS OF RELIABILITY PREDICTIONS FOR THE APOLLO SPACECRAFT
B. L. Amstadter 15 Jun. 1966 112 p
(Contract NAS9-150)
(NASA-CR-85994; NAS 1.26:85994; SID-66-744) Avail: NTIS HC A06/MF A01 CSCL 22A

A new method of reliability prediction for complex systems is defined. Calculation of both upper and lower bounds are involved, and a procedure for combining the two to yield an approximately true prediction value is presented. Both mission success and crew safety predictions can be calculated, and success probabilities can be obtained for individual mission phases or subsystems. Primary consideration is given to evaluating cases involving zero or one failure per subsystem, and the results of these evaluations are then used for analyzing multiple failure cases. Extensive development is provided for the overall mission success and crew safety equations for both the upper and lower bounds. Author

N83-36044# Office of Technology Assessment, Washington, D.C.
UNISPACE '82: A CONTEXT FOR INTERNATIONAL COOPERATION AND COMPLETION
Mar. 1983 86 p
(PB83-201848; OTA-TM-ISC-26) Avail: NTIS HC A05/MF A01 CSCL 22A

UNISPACE '82 was a United Nations Conference on the Exploration and Peaceful Uses of Outer Space, held in Vienna, Austria, in August, 1982. Ninety-four nations, including the United States, attended. UNISPACE '82 demonstrated that the role of the United States in international space affairs is presently in a state of transition. The developing world continues to press for access to technological and physical space resources, while our allies and other developed countries now compete for the sale of space technologies heretofore only offered by the United States. As this technical memorandum points out, to use the opportunities that conferences such as UNISPACE '82 present, the United States will have to be better prepared, including a coherent set of long-term domestic policy goals for space. Author (GRA)

N83-36627# Joint Publications Research Service, Arlington, Va.
CONVERSATION WITH PARTICIPANT IN PREPARATIONS FOR EXTRATERRESTRIAL LAUNCHES
Aleksandr Nemov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 4-9 Transl. into ENGLISH from Sov. Rossiya (Moscow), 8 Apr. 1983 p 4 (For primary document see N83-36625 24-51)
Avail: NTIS HC A05

N83-36628# Joint Publications Research Service, Arlington, Va.
SPACEFLIGHT-RELATED QUESTIONS AND ANSWERS
V. Pishchik, comp. *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 10-12 Transl. into ENGLISH from Sov. Rossiya (Moscow), 8 Apr. 1983 p 4 (For primary document see N83-36625 24-52)
Avail: NTIS HC A05

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N83-36396# National Space Development Agency, Tokyo (Japan). First Group of Satellite Design.
SIMPLIFIED ALGORITHM FOR APOGEE BOOST MOTOR SIZING
Masao Furukawa *In* Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1982 p 80-90 Original language document was announced as A82-47068 (For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N83-36045# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
APPLICATIONS OF SCIENTIFIC SATELLITE DATA ANALYSIS SYSTEMS TO SATELLITES P78-2, S3-4 AND P78-1 Final Report, 1 Nov. 1980 - 31 Jan. 1983
Dennis E. Delorey and Paul N. Pruneau Hanscom AFB, Mass. AFGL 31 Jan. 1983 74 p
(Contract F19628-81-C-0053; AF Proj. 9993)
(AD-A130106; BC-SDAL-82-2; AFGL-TR-82-0360) Avail: NTIS HC A04/MF A01 CSCL 09/2

Scientific Satellite Data Analysis Systems (SSDAS) have been developed and implemented for satellites P78-2 (SCATHA), S3-4 and P78-1. Analysis routines have resulted in the creation of data bases for multiple Air Force Geophysics Laboratory (AFGL) probes. System methods and analysis techniques used in the creation of SCATHA final atlas data bases are described. Analysis techniques for P78-1 and S3-4 probe data are also described. Author (GRA)

N83-36046# Rome Air Development Center, Griffiss AFB, N.Y.
HF SATELLITE ANTENNA ANALYSIS
Bertus Weijers Oct. 1982 40 p refs
(AF Proj. 4600)
(AD-A130107; RADC-TR-82-230) Avail: NTIS HC A03/MF A01 CSCL 09/5

Results of a satellite antenna analysis using the Antenna Modelling Program (AMP) are presented. A satellite structure with an HF dipole antenna attached was simulated using a wire grid model. The HF dipole antenna is part of a receiving system in Earth orbit used for an ionospheric ducted mode experiment. The antenna gain patterns for several possible satellite antenna configurations are presented and analyzed to determine acceptable configurations for the ducted mode experiment. Examined were the influence of dipole element length, orientation of the elements, and their positioning with respect to the satellite structure for frequencies from 6 to 30 MHz. Also, the antenna impedances were calculated to determine the possible losses when the antenna is terminated in a resistive impedance load. The influence of the ionospheric plasma on the mismatch losses was also estimated.
Author (GRA)

N83-36047# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
TRAFFIC ASSIGNMENT IN COMMUNICATION SATELLITES Management Science Research Report
Egon Balas and Philip R. Landweer Apr. 1983 22 p refs
(Contract N00014-82-K-0329; Grant NSF ECS-82-05425)
(AD-A129865; MSRR-491; WP-58-82-83) Avail: NTIS HC A02/MF A01 CSCL 17/2

A high capacity communication satellite interconnects scores of ground stations simultaneously. Under the Satellite-Switched/ Time Division Multiple Access (SS/TDMA) system, each channel of the satellite is allocated to a pair of ground stations for a certain time period, after which the whole set of allocations (called a switch) is changed simultaneously. The problem the authors is to minimize the time length of the entire sequence of switches, subject to a limit on the number of switches. They formulate this as a 3-index bottleneck-sum assignment problem, and solve it by a heuristic that obtains consistently better results than earlier methods based on different formulations. Author (GRA)

N83-36048# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SATNET (ATLANTIC PACKET SATELLITE EXPERIMENT) DEVELOPMENT AND OPERATION PLURIBUS SATELLITE IMP DEVELOPMENT INTERNET OPERATIONS AND MAINTENANCE MOBILE ACCESS TERMINAL NETWORK Quarterly Technical Report, 1 Feb. - 30 Apr. 1983
J. F. Haverty May 1983 65 p
(Contracts MDA903-80-C-0353; N00039-81-C-0408; ARPA Order 3214)
(AD-A129828; BBN-5345; QTR-29) Avail: NTIS HC A04/MF A01 CSCL 17/2

This Quarterly Technical Report describes work on the development of and experimentation with packet broadcast by satellite; on development of Pluribus Satellite IMPs; on Internetwork monitoring; and on shipboard satellite communications. GRA

N83-36049# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DSCS (DEFENSE SATELLITE COMMUNICATIONS SYSTEM) III 9444 DESPIN POINTING ANOMALY Final Report
P. H. Fowler 1 Apr. 1983 89 p
(Contract F04701-80-C-0022)
(AD-A129815; TRW-36060-AR-026) Avail: NTIS HC A05/MF A01 CSCL 22/2

This report presents the results of an investigation of minor intermittent pointing wander in 9444 and other DSCS II satellites. It describes the effect to sticking in the preload mechanism, and shows numerical reasons for this conclusion. Author (GRA)

N83-36050# Boeing Aerospace Co., Seattle, Wash. Logistics Design Support Dept.
MISSILE AND SPACE SYSTEMS RELIABILITY VERSUS COST TRADE-OFF STUDY Final Technical Report, 27 Oct. 1981 - 26 Oct. 1982
Roger C. Hall, Timothy G. Milliren, and Robert C. Schneider Griffiss AFB, N.Y. RADC Jan. 1983 156 p
(Contract F30602-81-C-0195; AF Proj. 2338)
(AD-A129328; RADC-TR-83-13; D194-30065-1) Avail: NTIS HC A08/MF A01 CSCL 16/4

This report consisting of a user's guide (Part 1) and back-up data (Part 2), was developed to provide reliability program/task cost guidelines to DoD program reliability managers and monitors. The primary use of the guidelines is for assistance in tailoring task provisions of MIL-STD-785 and MIL-STD-1543 (USAF) as applied to space and missile systems. Displayed data includes program/task cost statistics developed as a function of program/ system phase and other significant characteristics. The study data base includes program/task cost statistics developed as a function of a program/system phase and other significant characteristics. The study data base includes program/task costs derived from 13 space/missile programs and results from a program/system characteristic cost impact survey. These data along with the associated analyses are summarized in Part 2 of the study.
Author (GRA)

N83-36051# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHINA AGAIN TESTS INTERCONTINENTAL BALLISTIC MISSILE
12 May 1983 5 p Transl. into ENGLISH from Conmilit (China), v. 6, no. 9, issue 72, 1 Nov. 1982 p 49
(AD-A129332; FTD-ID(RS)T-0075-83) Avail: NTIS HC A02/MF A01 CSCL 16/4

An ICBM launch into the high seas within a circular ocean region having a radius of 35 nmi and centered at 28 13N, 123 53E by China is announced. Author

N83-36052# Army Missile Command, Redstone Arsenal, Ala. Systems Simulation and Development Directorate.
SURVEY OF MISSILE SIMULATION AND FLIGHT MECHANICS FACILITIES IN NATO
Willard M. Holmes May 1983 140 p refs Supplement to AGARD-AG-279
(AD-A129500; AD-E950395; DRSMI/RD-83-4-TR) Avail: NTIS HC A07/MF A01 CSCL 16/1

This report presents the results of a Flight Mechanics Panel (FMP) sponsored survey of twenty-four (24) simulation and flight mechanics facilities in six NATO community nations: France, the Federal Republic of Germany, Italy, the Netherlands, the United Kingdom and the United States. The survey included government and contractor facilities and was obtained by a combination of a questionnaire mailed to each facility and a follow-up on-site visit and interview with facility managers and operational personnel.
GRA

N83-36053# Sandia Labs., Albuquerque, N. Mex.
DRIFT PREDICTION FOR A ROLL-STABILIZED INERTIAL MEASUREMENT SYSTEM
V. I. Bateman 1983 28 p refs Presented at the 12th Transducer Workshop, Melbourne, Fla., 7 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012635; SAND-82-1877C; CONF-830639-4) Avail: NTIS HC A03/MF A01

This system measures three orthogonal body angular rates and three orthogonal body accelerations and calculates three Euler angles for attitude control of small rocket systems and/or large rocket payloads in flight. An analysis of the predicted drift in the Euler angles was undertaken to aid in the definition of computational hardware characteristics (such as gyro resolution and gyro sample frequency) and to assess the performance of the system over typical trajectories. The method of analysis uses two different techniques to calculate Euler angles and to compare the results. The first technique results in a true Euler angle which is calculated by a Bortz equation (a method to relate vehicle body coordinates

to Earth coordinates.) The second technique simulates the in-flight calculations by including effects of drift from the truncated Bortz algorithm, quantization, and random gyro drift. The comparison results in drift as a function of time for the three Euler angles, roll, pitch, and yaw. Examples of predicted drift over typical trajectories are presented. DOE

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N83-36054*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARATIVE EVALUATION OF SPACE TRANSPORTATION SYSTEM (STS)-3 FLIGHT AND ACOUSTIC TEST RANDOM VIBRATION RESPONSE OF THE OSS-1 PAYLOAD
Frank J. On Sep. 1983 185 p refs
(NASA-TM-85089; NAS 1.15:85089) Avail: NTIS HC A09/MF A01 CSCL 22B

A comparative evaluation of the Space Transportation System (STS)-3 flight and acoustic test random vibration response of the Office of Space Science-1 (OSS-1) payload is presented. The results provide insight into the characteristics of vibroacoustic response of pallet payload components in the payload bay during STS flights. Author

N83-36055*# Systems Dynamics, Inc., Gainesville, Fla.
SPACE SHUTTLE PROPULSION PARAMETER ESTIMATION USING OPTIMAL ESTIMATION TECHNIQUES Monthly Progress Report
20 Aug. 1983 74 p refs
(Contract NAS8-35324)
(NASA-CR-170868; NAS 1.26:170868; MPR-4) Avail: NTIS HC A04/MF A01 CSCL 22B

This fourth monthly progress report again contains corrections and additions to the previously submitted reports. The additions include a simplified SRB model that is directly incorporated into the estimation algorithm and provides the required partial derivatives. The resulting partial derivatives are analytical rather than numerical as would be the case using the SOBER routines. The filter and smoother routine developments have continued. These routines are being checked out. Author

N83-36056*# Systems Dynamics, Inc., Gainesville, Fla.
SPACE SHUTTLE PROPULSION PARAMETER ESTIMATION USING OPTIMAL ESTIMATION TECHNIQUES Monthly Progress Report
20 Sep. 1983 75 p refs
(Contract NAS8-35324)
(NASA-CR-170878; NAS 1.26:170878; MPR-5) Avail: NTIS HC A04/MF A01 CSCL 22B

The fifth monthly progress report includes corrections and additions to the previously submitted reports. The addition of the SRB propellant thickness as a state variable is included with the associated partial derivatives. During this reporting period, preliminary results of the estimation program checkout was presented to NASA technical personnel. Author

N83-36057# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
LABORATORY STUDY OF SPACE SHUTTLE PROPELLANT TANK ICING
J. F. Bott, D. H. Ross, D. J. Spencer, and J. S. Whittier 17 May 1983 39 p refs
(Contract F04701-82-C-0083)
(AD-A129568; SD-TR-83-32; TR-0083(3464-02-1)) Avail: NTIS HC A03/MF A01 CSCL 22/2

Small-scale experiments were performed with SOFI (sprayed-on-foam-insulation) panels shaved to 0.5 and 0.9 in. thicknesses. The rear sides of the SOFI panels were cooled to LN2 temperatures; the front sides were exposed to an environmental chamber with controlled temperature and humidity. The measured rates of frost formation and the observed surface temperatures are consistent with predictions obtained with a simple heat balance model. The measured frost densities, on the other hand, were less than 6 lb/cubic feet, much lower than those predicted by the University of Dayton Research Institute frost formation model. In a worst-case test, hard ice was observed when water was dripped down the surface of a 0.5 in. thick LN2-chilled SOFI panel. A preliminary study of solar melting produced little rundown or ice. Frost densities of less than 0.1 g/cubic centimeter (6 lb/cubic feet) were obtained, except in the test in which water was dripped onto the surface. Validation by the present experiments of predictions based on a heat balance model applies only to natural convection in the laminar flow regime. A large fraction of the flow on the space shuttle fuel tank will be in the turbulent regime because of the height of the tank. Larger-scale tests would be required to validate the turbulent heat transfer coefficients. Author (GRA)

N83-36058# ARO, Inc., Arnold Air Force Station, Tenn.
WIND LEADING EDGE HEATING AND PRESSURE PROBING, BODY FLAP HEATING, AND VAPOR SCREEN TESTS ON THE SPACE SHUTTLE ORBITER CONFIGURATION AT MACH 8 AND 10 Final Report, 27 Jul. - 23 Nov. 1982
L. A. Ticatch, S. A. Stapenek, and G. D. Wannenwetsch AEDC Jan. 1983 99 p ref
(AF Proj. 2404)
(AD-A129387; AEDC-TSR-83-V7) Avail: NTIS HC A05/MF A01 CSCL 20/4

Tests were performed on scale models of the Space Shuttle Orbiter at angles of attack from 25 to 40 degrees at Mach 8 and 10. Thin-film instrumentation and testing techniques were used to provide aero-heating measurements on the wing leading edge. Standard techniques were adapted to obtain body flap heating measurements over a range of flap angles (0-20 deg) using a continuous sweep testing mode for various boundary layer transition locations. Pitot pressure probing was conducted in the vicinity of the wing leading edge and vapor screen photographs were obtained at various stations along the entire length of the orbiter body. Only sample tabulations of the test results are included in this documentary report. Author (GRA)

N83-36059*# National Academy of Sciences - National Research Council, Washington, D. C. Committee on NASA Program Reviews.
ASSESSMENT OF CONSTRAINTS ON SPACE SHUTTLE LAUNCH RATES Final Report
Apr. 1983 63 p refs
(Contract NASw-3511)
(NASA-CR-173081; NAS 1.26:173081; PB83-217976) Avail: NTIS HC A04/MF A01 CSCL 22B

The range of number of annual STS flights with 4- and 5-orbiter fleets was estimated and an overview of capabilities needed to support annual rates of 24 and up with a survey of known constraints and emphasis on External Tank (ET) production requirements was provided. Facility capability estimates are provided for ground turnaround, cargo handling, flight training and flight operations. Emphasizing the complexity of the STS systems and the R&D nature of present flight experience, it is concluded that the most prominent constraints in the early growth of the STS as an operational system may manifest themselves not as shortages of investment items such as the ET or SRB, but as inability to provide timely repairs or replacement of flight system components needed to sustain launch rates. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N83-36307*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TELEMETRY MODULATION AND COPING
P. W. Kinman *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 12 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-36060*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WEIGHT TRENDS FOR A FULLY REUSABLE ADVANCED SINGLE-STAGE SHUTTLE
Ian O. MacConochie and Robert W. LeMessurier (Kentron International, Hampton, Va.) Sep. 1983 30 p refs Presented at the 42nd Ann. Conf. of the Soc. of Allied Weight Engr., Inc., Anaheim, Calif., 23-25 May 1983 Previously announced in IAA as A83-33969
(NASA-TM-85656; NAS 1.15:85656; SAWE Paper-1554) Avail: NTIS HC A03/MF A01 CSCL 22B

The rate at which subsystem weights grow with vehicle gross weight is assessed and is shown to be critical to the efficiency of large Earth to orbit transports. The overall trend, however, is a reduction in the inerts as a percentage of gross weight as the vehicle size is increased. For this reason, the larger the vehicle, the greater the payload weight delivered per pound of vehicle manufactured. Other critical issues addressed include the effects of wing loading and wing size on wing weight, the effect of entry planform loading on thermal protection system weight, the impact of power demand on cooling system and prime power weight, and tank fineness ratio on insulation weight. The effects of body shape and various internal packaging arrangements on weight and balance are also discussed. The greatest impact on overall vehicle weight is body shape and internal packaging, and could account for weight savings of up to 30 percent in body structure. Other subsystems are important, but the savings are much smaller in relation to overall vehicle weight--individually less than one percent. Author

N83-36061*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE WORKSHOP ON APPLICATIONS OF DISTRIBUTED SYSTEM THEORY TO THE CONTROL OF LARGE SPACE STRUCTURES
G. Rodriguez, ed. 1 Jul. 1983 635 p refs Workshop held in Pasadena, Calif., 14-16 Jul. 1982; sponsored by JPL and NASA. Langley Research Center
(Contract NAS7-100)
(NASA-CR-173119; JPL-Pub-83-46; NAS 1.26:173119) Avail: NTIS HC A99/MF A01 CSCL 22B

Two general themes in the control of large space structures are addressed: control theory for distributed parameter systems and distributed control for systems requiring spatially-distributed multipoint sensing and actuation. Topics include modeling and control, stabilization, and estimation and identification. For individual titles, see N83-36062 through N83-36096.

N83-36062*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
MODELING AND CONTROL OF DISTRIBUTED STRUCTURES
L. Meirovitch *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 1-29 refs (For primary document see N83-36061 24-18)
(Grant NAG1-225)
Avail: NTIS HC A99/MF A01 CSCL 22B

An inherent incongruity in the modeling of controls for structures is discussed. Structures are basically distributed-parameter systems, described by partial differential equations, and control theory is concerned almost exclusively with discrete (in space) systems, described by ordinary differential equations. The standard approach to solving this dilemma is to discretize the system in space, which precludes the use of distributed controls. A different approach, known as the independent modal-space control method, is designed to eliminate the incongruity by bringing about a closer correspondence between modeling and control theory. The independent modal-space control method can treat distributed structures as well as discretized models and it permits design of both distributed and discrete-point controls. M.G.

N83-36063*# Toronto Univ. (Ontario).
SPACE STRUCTURE VIBRATION MODES: HOW MANY EXIST? WHICH ONES ARE IMPORTANT? c28
Peter C. Hughes *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 31-47 refs Sponsored in part by Natural Sciences and Engineering Research Council of Canada (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

Several assertions are argued regarding mode analysis of structural vibration. The idea of a 'mode' is, in essence, a mathematical one. It is highly unlikely that any real structure can vibrate exactly so that all its points move in unison; in other words, it is highly unlikely that any structure has any modes. As an approximation, however, the use of a mode is an excellent one for many structures, especially for the 'lower modes'. The agreement between experiment and theory for the 'higher modes' tends to become weaker. In this approximate sense, most structures have a very large number of modes. It is elementary to show, however, that no real structure has an infinite number of modes. The only utility of the 'infinite modes' idea is within the purely mathematical domain. Many 'error indices' can be defined as guidelines for structural modal order reduction. Simple modal truncation, although suggested by experience with slender rods, is naive. The proper process is mode selection, based on a appropriate error criterion. M.G.

N83-36064*# Grumman Aerospace Corp., Bethpage, N.Y. Research and Development Center.
CONTROL OF FLEXIBLE STRUCTURES: A SYSTEMATIC OVERVIEW OF THE PROBLEM
Richard Gran *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 49-61 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

A way of designing a control system using a finite model that accounts for the distributed nature of the control problem in a systematic way is described. This is accomplished by using a mode description of the system and from that description determining the number of modes that must be retained based on the performance and the disturbance descriptions. The design then uses a full order model that includes all of the dynamics: sensor, actuator, disturbance and flexible motion. The designs that result are simple, robust, perform well and have the added distinction of being easy to implement. M.G.

N83-36065*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
INTRODUCTION AND SURVEY ON CONTINUUM MODELS FOR REPETITIVE LATTICE STRUCTURES
Larry S. Weisstein *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 63-70 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

A brief introduction and survey to aid and familiarize researchers interested in the use of continuum modeling procedures applied towards large space structure technology are presented. The use of such structural models for the distributed control of large flexible lattice structures offers a significant advantage over a numerical approach. M.G.

N83-36066*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MINIMUM INFORMATION MODELLING OF STRUCTURAL SYSTEMS WITH UNCERTAIN PARAMETERS
David C. Hyland *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 71-88 refs Sponsored by AF (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

Work is reviewed wherein the design of active structural control is formulated as the mean-square optimal control of a linear mechanical system with stochastic parameters. In practice, a complete probabilistic description of model parameters can never be provided by empirical determinations, and a suitable design approach must accept very limited a priori data on parameter statistics. In consequence, the mean-square optimization problem is formulated using a complete probability assignment which is made to be consistent with available data but maximally unconstrained otherwise through use of a maximum entropy principle. The ramifications of this approach for both robustness and large dimensionality are illustrated by consideration of the full-state feedback regulation problem. M.G.

N83-36067*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISTRIBUTED SYSTEM MODELING OF A LARGE SPACE ANTENNA c39
M. Hamidi, G. Rodriguez, and D. B. Schaechter *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 89-102 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

A general approach for distributed parameter modeling of complex dynamical systems is described. The method consists of dividing the system in parts which can be modeled by simple partial differential equations and coupling the equations thus obtained by applying Hamilton's variational formalism to the entire system. The modeling of a large, offset-fed, wrap-rib antenna is presented to illustrate the approach. Although such models are perhaps not as precise as finite element models, they can be useful for initial physical insight and parametric design. M.G.

N83-36068*# Stanford Univ., Calif.
MODELING OF FLEXIBLE STRUCTURES FOR ACTIVE CONTROL
Arthur E. Bryson, Jr. *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 103-118 ref (For primary document see N83-36061 24-18)
(Grant NAG1-236)
Avail: NTIS HC A99/MF A01 CSCL 22B

If a flexible structure has a plane of symmetry, the equations of motion can be split into two uncoupled sets, one for symmetrical motions and one for anti-symmetric motions. If there are m controls, it is often convenient to assign the linear combinations of controls that enter into the m lowest frequency modes and new controls. As an example the feed-support structure of a spacecraft antenna is considered. It is modeled as a tetrahedron made up of flexible bars and connected to the spacecraft by six short flexible legs containing force actuators and displacement sensors. Due to the three-sided symmetry of this structure, both the symmetric and the anti-symmetric equations of motion can be decoupled into two subsystems. The resulting four subsystems are: (1) pitch/fore-aft motions with four degrees of freedom (DOF), two controls, and one output (the fore-aft motion of the feed); (2) vertical motions with three DOF, one control, and one output (the vertical motion of the feed); (3) roll/lateral motions with four DOF, two controls, and one output (the lateral motions of the feed); and (4) yaw motion with one DOF, one control, and no output (the feed does not move during yaw motion). M.G.

N83-36069*# California Inst. of Tech., Pasadena.
VIBRATION SUPPRESSION IN LARGE SPACE STRUCTURES c39
T. K. Caughey and C. J. Goh *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 119-142 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

The problem of potential instability caused by actuator dynamics is examined. Two ways of overcoming it are discussed: rate feedback with compensation and position feedback with tuning filters. M.G.

N83-36070*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROL OF ANTENNA-FEED ATTITUDE AND REFLECTOR VIBRATIONS IN LARGE SPACEBORNE ANTENNAS BY MECHANICAL DECOUPLING AND MOVABLE DAMPERS c32
P. K. C. Wang, E. C. Hong, and J. S. Sarina *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 143-161 refs Prepared in cooperation with California Univ., Los Angeles (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20N

Simple, practical methods for damping reflector vibrations and designing antenna-feed attitude control systems in large deployable spaceborne antennas are proposed. The former involves a movable damper which is positioned so that the rate-of-change of total vibrational energy is minimized. The latter introduces a mechanical decoupler between the flexible boom and the antenna-feed, whereby the feed-attitude control system can be designed independent of boom dynamics. The validity of these approaches are substantiated by analytical studies, computer simulation, and experimental studies. M.G.

N83-36071*# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
A CLOSED-LOOP PRINCIPAL COMPONENT ANALYSIS OF A TETRAHEDRAL TRUSS c39
Edmond A. Jonckheere *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 163-180 refs (For primary document see N83-36061 24-18)
(Grant NSF ECS-81-12327)
Avail: NTIS HC A99/MF A01 CSCL 20K

A tetrahedral truss, representative of a fairly broad class of large space structures, is considered. A method, measuring the dynamical importance of each elastic mode when the structure is under feedback control, is presented. The main conclusion is that the closed-loop importance of each vibration mode depends on the robustness requirements. Also, there appears to be a conflict between precise control of a given node of the structure and stability margin, these two requirements leading to contradictory classifications of the modes by order of importance. M.G.

N83-36072*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROL OF LARGE SPACE ANTENNAS BASED ON ELECTROMAGNETIC-STRUCTURAL MODELS c32
Massih Hamidi and Farzin Manshadi *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large

Space Struct. 1 Jul. 1983 p 181-194 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20N

A general approach to the optimal control of large space antennas based on their RF/structural characteristics is described. The approach consists of defining a cost functional based on the degradation of the RF performance of the antenna and using the structural model as the dynamic system. The method is applied to the design of an optimal controller for a 55-m, wrap-rib offset-fed antenna. The controller's goal is to minimize the variations of the peak electric field of the antenna due to feed displacements. M.G.

N83-36073*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACTIVE CONTROL OF SPACE STRUCTURES (ACOSS) MODEL 2 **c18**
Timothy C. Henderson *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 195-210 (For primary document see N83-36061 24-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

A complete description of the active control of space structures model #2 which is a simple but realistic evaluation model is given. The design of this system was driven by the desire to incorporate certain attributes into the overall system characteristics. The desired features were structural design based on realistic sizes and weights; a simple unclassified optical system with associated performance measures and tolerance; and a set of disturbances typical of equipment vibration and attitude control (slew). The resulting model is described in detail along with the resulting mode shapes and natural frequencies of the system. A description of the line-of-sight performance measure including theory and implementation is given. R.J.F.

N83-36074*# Stanford Univ., Calif.
TRAVELLING WAVE EFFECTS IN LARGE SPACE STRUCTURES
Andy vonFlotow *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 211-223 refs Sponsored in part by AFOSR (For primary document see N83-36061 24-18)
(Grant NAG1-97)
Avail: NTIS HC A99/MF A01 CSCL 22B

Several aspects of travelling waves in Large Space Structures (LSS) are discussed. The dynamic similarity among LSS's, electric power systems, microwave circuits and communications network is noted. The existence of time lag between actuation and response is illuminated with the aid of simple examples, and their prediction is demonstrated. To prevent echoes, communications lines have matched terminations; this idea is applied to the design of dampers of one dimensional structures. Periodic structures act as mechanical band pass filters. Implications of this behavior are examined on a simple example. It is noted that the implication is twofold; continuum models of periodic lattice structures may err considerably; on the other hand, it is possible to design favorable transmission (and resonance) characteristics into the structure. Author

N83-36075*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISTRIBUTED CONTROL OF LARGE SPACE ANTENNAS **c33**
J. M. Cameron, M. Hamidi, Y. H. Lin, and S. J. Wang *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 225-247 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 09C

A systematic way to choose control design parameters and to evaluate performance for large space antennas is presented. The structural dynamics and control properties for a Hoop and Column Antenna and a Wrap-Rib Antenna are characterized. Some results of the effects of model parameter uncertainties to the stability, surface accuracy, and pointing errors are presented. Critical dynamics and control problems for these antenna configurations are identified and potential solutions are discussed. It was concluded that structural uncertainties and model error can cause serious performance deterioration and can even destabilize the controllers. For the hoop and column antenna, large hoop and long meat and the lack of stiffness between the two substructures result in low structural frequencies. Performance can be improved if this design can be strengthened. The two-site control system is more robust than either single-site control systems for the hoop and column antenna. R.J.F.

N83-36076*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
NUMBER AND PLACEMENT OF CONTROL SYSTEM SENSORS CONSIDERING POSSIBLE FAILURES
Wallace E. VanderVelde and Craig R. Carignan *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 253-268 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

A methodology has been presented which is intended to assist the designer of a control system for a large space structure to decide how many sensors should be incorporated in the system and where they should be placed on the structure. This approach is intended to be especially useful in the early stages of the evolution of the system, before a complete control system concept has been defined. This methodology is based on a quantitative measure of the observability of the system for a given set of sensors. The effect of possible component failures during the mission period was incorporated in the measure. The question of sensor placement is then resolved by finding the locations which maximize the performance measure. The number of components to use cannot be determined by optimizing the measure because the observability always improves with increased number of sensors if they are optimally located. However, the improvement in the measure with component number can be determined, and this information can be used along with data on cost, power required, etc., to decide how many sensors to use. Author

N83-36077*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
THE TOYSAT STRUCTURAL CONTROL EXPERIMENT
J. A. Breakwell and G. J. Chambers *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 269-285 (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Lockheed TOYSAT experiment is described. The experiment was designed to test hypothesis concerning the application of optimal control theory to flexible spacecraft. The theory is presented, and results described. Author

N83-36078*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
LARGE SPACE STRUCTURE MODEL REDUCTION AND CONTROL SYSTEM DESIGN BASED UPON ACTUATOR AND SENSOR INFLUENCE FUNCTIONS
Y. Yam, J. H. Lang, T. L. Johnson, S. Shih, and D. H. Staelin *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 287-304 refs (For primary document see N83-36061 24-18)
(Contract DAAG29-78-C-0020)
Avail: NTIS HC A99/MF A01 CSCL 22B

A model reduction procedure based on aggregation with respect to sensor and actuator influences rather than modes is presented for large systems of coupled second-order differential equations. Perturbation expressions which can predict the effects of spillover on both the aggregated and residual states are derived. These expressions lead to the development of control system design constraints which are sufficient to guarantee, to within the validity of the perturbations, that the residual states are not destabilized by control systems designed from the reduced model. A numerical example is provided to illustrate the application of the aggregation and control system design method. Author

N83-36079*# Georgia Inst. of Tech., Atlanta. Dept. of Mechanical Engineering.

A DESIGN PROCEDURE FOR ACTIVE CONTROL OF BEAM VIBRATIONS

Stephen L. Dickerson and George Jarocki *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 305-316 refs (For primary document see N83-36061 24-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

The transverse vibrations of beams is discussed and a methodology for the design of an active damping device is given. The Bernoulli-Euler equation is used to derive a transcendental transfer function, which relates a torque applied at one end of the beam to the rotational position and velocity at that point. The active damping device consists of a wire, a linear actuator and a short torque arm attached to one end of the beam. The action of the actuator varies a tension in the wire and creates a torque which opposes the rotation of the beam and thus damps vibration. A design procedure for such an active damper is given. This procedure shows the relationships and trade-offs between the actuator stroke, power required, stress levels in the wire and beam and the geometry of the beam and wire. It is shown that by consideration of the frequency response at the beam natural frequencies, the aforementioned relationships can be greatly simplified. Similarly, a simple way of estimating the effective damping ratios and eigenvalue locations of actively controlled beams is presented. R.J.F.

N83-36080*# McGill Univ., Montreal (Quebec). Dept. of Mechanical Engineering.

ON VIBRATION CONTROL OF TETHERED SATELLITE SYSTEMS

D. M. Xu, A. K. Misra, and V. J. Modi (British Columbia Univ.) *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 317-327 refs (For primary document see N83-36061 24-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

The general dynamics of a shuttle supported tethered subsatellite system taking into account the longitudinal and three dimensional transverse vibrations is considered. It is noted that control of inherently unstable dynamics during retrieval of the subsatellite can be carried out by letting the rate of change length depend on the state variables in an appropriate manner. Control laws using linear feedback of inplane state variables and nonlinear feedback of out-of-plane state variables are proposed. Author

N83-36081*# Stanford Univ., Calif. Dept. of Aeronautics/Astronautics.

ORBITING CHAINS AND RINGS

John V. Breakwell *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 329-336 refs (For primary document see N83-36061 24-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

Two very different, highly flexible, space structures proposed during the last decade which involve analytical solution of certain partial differential equations are discussed. The first structure is an array, or hanging chain of aluminum beads which would serve as a convenient communicator if, under the influence of the Earth's gravity gradient, it assumes a local vertical orientation as it circles the Earth. Two passive schemes have been proposed for damping the rigid modes: twist the wire at the ends to provide non-zero moment of inertia about the vertical, thereby inducing relative motion of the two tips during rigid pitch or roll, and thus exercising a damper; and introduce weak lossy springs between the end sections and the main section; thereby providing linear coupling between the springs and all the in-plane (pitch) modes. The second structure is a complete ring of satellites cabled together at synchronous altitude. By a slight increase in altitude, the cable is in tension. This configuration is, however, unstable, and an active feedback control scheme is required to stabilize it. A possible scheme involves local cable length adjustment based on measurement of local altitude and shape variations and their rates. R.J.F.

N83-36082*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

HARDWARE VERIFICATION OF DISTRIBUTED/ADAPTIVE CONTROL

Daniel B. Eldred and David B. Schaechter *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 337-350 refs (For primary document see N83-36061 24-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

Adaptive control techniques are studied for their future application to the control of large space structures, where uncertain or changing parameters may destabilize standard control system designs. The approach used is to examine an extended Kalman filter estimator, in which the state vector is augmented with the unknown parameters. The associated Riccati equation is linearized about the case of exact knowledge of the parameters. By assuming that parameter variations occur slowly, the filter complexity is reduced further yet. Simulations on a two degree-of-freedom oscillator demonstrate the parameter-tracking capability of the filter, and an implementation on the JPL Flexible Beam Facility using an incorrect model shows the adaptive filter/optimal control to be stable where a standard Kalman filter/optimal control design is unstable. R.J.F.

N83-36083*# Wisconsin Univ., Madison. Dept. of Mathematics.

SOME REMARKS ON THE CURRENT STATUS OF THE CONTROL THEORY OF SINGLE SPACE DIMENSION HYPERBOLIC SYSTEMS

D. L. Russell *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 351-381 refs (For primary document see N83-36061 24-18)

(Grant AF-AFOSR-0018-79)

Avail: NTIS HC A99/MF A01 CSCL 22B

Various aspects of the control theory of hyperbolic systems, including controllability, stabilization, control canonical form theory, etc., are reviewed. To allow a unified and not excessively technical treatment, attention is restricted to the case of a single space variable. A newly developed procedure of canonical augmentation is discussed. R.J.F.

N83-36084*# California Univ., Los Angeles.

APPROXIMATION IN CONTROL OF FLEXIBLE STRUCTURES, THEORY AND APPLICATION

J. S. Gibson *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 383-389 refs (For primary document see N83-36061 24-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

The sense in which the feedback control law based on an approximate finite dimensional model of a continuous structure approximates a control law which is optimal for the distributed, or infinite dimensional, model of the structure is studied. From the analysis of the various control and stability issues associated with this basis question, useful information for designing finite dimensional compensators which produce near-optimal performance in infinite dimensional systems is gained. Some of the important predictions that can be made about large-order finite dimensional control laws, using the theory of infinite dimensional Riccati equations are indicated. R.J.F.

N83-36085*# West Virginia Univ., Morgantown. Dept. of Mathematics.

SIMULTANEOUS CONTROL AND OPTIMIZATION FOR ELASTIC SYSTEMS

Vadim Komkov *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 391-408 refs (For primary document see N83-36061 24-18)

(Grant NSF CMS-80-05677)

Avail: NTIS HC A99/MF A01 CSCL 22B

Studies are conducted to determine the dynamic response of beams and plates to loads which are extreme within a certain class of admissible loads. Two approaches to this problem are suggested. In approach one, Pontryagin's maximality principle is

regarded as an additional constraint. The optimality of design is then determined by standard numerical techniques. The 'adjoint variable approach' to sensitivity of structural design is applied for a given inhomogeneous term. The inhomogeneous term is an extremal element of admissible load vectors, which constitute a closed subspace of a Sobolev space. Again, the maximality principle is invoked. While only beam and plate theory problems are used as examples, generalizations are easy to perceive. B.W.

N83-36086*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FIXED-ORDER DYNAMIC COMPENSATION THROUGH OPTIMAL PROJECTION
David C. Hyland and Appasaheb N. Madiwale *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 409-425 refs Sponsored by AF (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

This paper reviews a formulation for the design of fixed-order dynamic compensation for flexible mechanical systems which is based upon explicit optimality conditions derived under the minimum data/maximum entropy stochastic modelling approach. The optimality conditions give rise to the novel concept of 'optimal projection' which provides significant insight with regard to the compensator structure and permits earlier, more restricted and/or ad hoc design schemes to be seen as special cases of the present formulation. Author

N83-36087*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical, Computer, and Systems Engineering.
STABLE FEEDBACK CONTROL OF DISTRIBUTED PARAMETER SYSTEMS: TIME AND FREQUENCY DOMAIN CONDITIONS
Mark J. Balas *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 427-449 refs (For primary document see N83-36061 24-18)
(Grants NAG1-171; NSF ECS-80-16173)
Avail: NTIS HC A99/MF A01 CSCL 22B

Large space structures, or any mechanically flexible structures, are inherently distributed parameter systems (DPS) whose dynamics are modeled by partial, rather than ordinary, differential equations. Such DPS are described by operator equations on an infinite-dimensional Hilbert (or Banach) space. However, any feedback controller for such a DPS must be a finite-dimensional (and discrete-time) system in order to be implemented with on-line digital computers and a finite (small) number of actuators and sensors. There are many ways to synthesize such controllers; the Galerkin or finite-element approach is emphasized. B.W.

N83-36088*# California Univ., Los Angeles.
APPROXIMATION OF THE OPTIMAL COMPENSATOR FOR A LARGE SPACE STRUCTURE
Michael K. Mackay *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 451-463 refs Revised (For primary document see N83-36061 24-18)
(Grant AF-AFOSR-3550-78)
Avail: NTIS HC A99/MF A01 CSCL 22B

This paper considers the approximation of the optimal compensator for a Large Space Structure. The compensator is based upon a solution to the Linear Stochastic Quadratic Regulator problem. Colocation of sensors and actuators is assumed. A small gain analytical solution for the optimal compensator is obtained for a single input/single output system, i.e., certain terms in the compensator can be neglected for sufficiently small gain. The compensator is calculated in terms of the kernel to a Volterra integral operator using a Neumann series. The calculation of the compensator is based upon the C sub 0 semigroup for the infinite dimensional system. A finite dimensional approximation of the compensator is, therefore, obtained through analysis of the infinite dimensional compensator which is a compact operator. Author

N83-36089*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
ANALYSIS OF STRUCTURAL PERTURBATIONS IN SYSTEMS VIA COST DECOMPOSITION METHODS
Robert E. Skelton *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 465-475 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

It has long been common practice to analyze linear dynamic systems by decomposing the total response in terms of individual contributions which are easier to analyze. Examples of this philosophy include the expansion of transfer functions using: (1) the superposition principle, (2) residue theory and partial fraction expansions, (3) Markov parameters, Hankel matrices, and (4) regular and singular perturbations. This paper summarizes a new and different kind of expansion designed to decompose the norm of the response vector rather than the response vector itself. This is referred to as 'cost-decomposition' of the system. The notable advantages of this type of decomposition are: (a) easy application to multi-input, multi-output systems, (b) natural compatibility with Linear Quadratic Gaussian Theory, (c) applicability to the analysis of more general types of structural perturbations involving inputs, outputs, states, parameters. Property (c) makes the method suitable for problems in model reduction, measurement/actuator selections, and sensitivity analysis. Author

N83-36090*# Pennsylvania State Univ., University Park. Dept. of Mathematics.
FINITE DIFFERENCE NUMERICAL METHODS FOR BOUNDARY CONTROL PROBLEMS GOVERNED BY HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS c64
Goong Chen, Quan Zheng, Matthew Coleman, and Sunethra Weerakoon *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 477-495 refs (For primary document see N83-36061 24-18)
(Grant NSF MCS-81-01892)
Avail: NTIS HC A99/MF A01 CSCL 12A

This paper briefly reviews convergent finite difference schemes for hyperbolic initial boundary value problems and their applications to boundary control systems of hyperbolic type which arise in the modelling of vibrations. These difference schemes are combined with the primal and the dual approaches to compute the optimal control in the unconstrained case, as well as the case when the control is subject to inequality constraints. Some of the preliminary numerical results are also presented. B.W.

N83-36091*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
ALGORITHMS FOR ESTIMATION IN DISTRIBUTED MODELS WITH APPLICATIONS TO LARGE SPACE STRUCTURES c61
H. T. Banks *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 505-509 refs (For primary document see N83-36061 24-18)
(Grant NAG1-258; Contract DAAG29-79-C-0161; Grant AF-AFOSR-0198-81)
Avail: NTIS HC A99/MF A01 CSCL 09B

The author discussed the theoretical and computational results for spline based approximation schemes used in parameter estimation algorithms for distributed systems. Specific applications include beam-like structures described by the Euler-Bernoulli and Timoshenko theories and antenna surfaces such as that in the deployable Maypole Hoop/Column model. B.W.

N83-36092*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
IDENTIFICATION OF LARGE FLEXIBLE STRUCTURES MASS/STIFFNESS AND DAMPING FROM ON-ORBIT EXPERIMENTS c39
S. L. Hendricks, S. Rajaram, M. P. Kamat, and J. L. Junkins *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 511-520 refs Submitted for publication (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

Two methods for identifying the mass, damping and stiffness

matrices of a linear vibrating system are presented. Both methods require the measurement of acceleration, velocity and displacement at various locations of the system. In the first method, the response of the system subjected to known forces is used while the second method employs the free vibration data. The unknown parameters are recovered through the standard least squares procedure. Numerical results are presented for several examples. Author

N83-36093*# Warwick Univ. Coventry (England).
JOINT STATE AND PARAMETER ESTIMATION c64
N. Carmichael and M. D. Quinn (Sheffield City Polytechnic, England) *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 521-529 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 12A

Recent results are described concerning the problem of state reconstruction for a class of nonlinear distributed systems. The methods are then applied to the problem of joint state and parameter estimation. An example with the wave equation is presented. Author

N83-36094*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
PARAMETER ESTIMATION IN TRUSS BEAMS USING TIMOSHENKO BEAM MODEL WITH DAMPING c39
C. T. Sun and J. N. Juang (Martin Marietta Aerospace, Denver) *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 531-545 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

Truss beams with members having viscous damping are modeled with a Timoshenko beam. Procedures for deriving the equivalent bending rigidity, transverse shear rigidity, and damping are presented. Explicit expressions for these equivalent beam properties are obtained for a specific truss beam. The beam model thus established is then used to investigate the effect of damping in free vibration. Finally, the beam is employed in the estimation of structural parameters in a simply-supported truss beam using a random search algorithm. Author

N83-36095*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A FUNCTION SPACE APPROACH TO STATE AND MODEL ERROR ESTIMATION FOR ELLIPTIC SYSTEMS c64
G. Rodriguez *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 547-573 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 12A

An approach is advanced for the concurrent estimation of the state and of the model errors of a system described by elliptic equations. The estimates are obtained by a deterministic least-squares approach that seeks to minimize a quadratic functional of the model errors, or equivalently, to find the vector of smallest norm subject to linear constraints in a suitably defined function space. The minimum norm solution can be obtained by solving either a Fredholm integral equation of the second kind for the case with continuously distributed data or a related matrix equation for the problem with discretely located measurements. Solution of either one of these equations is obtained in a batch-processing mode in which all of the data is processed simultaneously or, in certain restricted geometries, in a spatially scanning mode in which the data is processed recursively. After the methods for computation of the optimal estimates are developed, an analysis of the second-order statistics of the estimates and of the corresponding estimation error is conducted. Based on this analysis, explicit expressions for the mean-square estimation error associated with both the state and model error estimates are then developed. B.W.

N83-36096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STATE AND MODEL ERROR ESTIMATION FOR ELLIPTIC SYSTEMS: APPLICATIONS TO LARGE ANTENNA STATIC SHAPE DETERMINATION c64
G. Rodriguez and R. E. Scheid, Jr. *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 575-603 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 12A

This paper outlines the application of various estimation approaches to the problem of static shape determination for large antenna systems. The problem consists of estimating the shape of an antenna surface from measurements of its static deflection. The estimation schemes are based on any one of the modeling options of a single PDE for early insight and understanding, coarse-resolution multiple-PDE models for parametric studies and fine-resolution piecewise-continuum models for detailed design. For any one of these three models, estimator design can be developed using an infinite-dimensional approach, where the necessary finite-element truncation and approximation is conducted after the analytical design has taken place, or it can be based on a finite-dimensional approach, where the model is truncated before the estimation problem is formulated. One of the main objectives of the paper is to develop both approaches while simultaneously investigating their differences and similarities. Simulation results of an application of the finite-dimensional approach to a large parabolic reflector are presented. B.W.

N83-36097*# Remtech, Inc., Huntsville, Ala.
AOTV LOW L/D PRELIMINARY AEROHEATING DESIGN ENVIRONMENT Final Report
Carl D. Engel Aug. 1983 109 p refs
(Contract NAS8-34590)
(NASA-CR-170877; NAS 1.26:170877; RTR-069-2) Avail: NTIS HC A06/MF A01 CSCL 22B

The aerothermal environment to a configuration with a brake face which exhibits a low lift to drag ratio (L/D) of below 0.75 is emphasized. The five times geosynchronous (5 x Geo) orbit entry was selected as the design trajectory. The available data base and math model is discussed. The resulting preliminary design environment is documented. Recommendations as to how the design environment may be improved through technological advances are given. S.L.

N83-36098*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
LOW CONCENTRATION RATIO SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 kW APPLICATION. VOLUME 2: DRAWINGS Final Report
S. J. Nalbandian and E. P. French Jul. 1982 175 p
(Contract NAS8-34214)
(NASA-CR-170870; NAS 1.26:170870; SSD-83-0075-2) Avail: NTIS HC A08/MF A01 CSCL 22B

A preliminary design effort directed toward a low concentration ratio photovoltaic array system based on 1984 technology and capable of delivering multi-hundred kilowatts (300 kW to 100 kW range) in low Earth orbit. The array system consists of two or more array modules each capable of delivering between 113 kW to 175 kW using silicon solar cells or gallium arsenide solar cells, respectively. The array module deployed area is 1320 square meters and consists of 4356 pyramidal concentrator elements. The module, when stowed in the Space Shuttle's payload bay, has a stowage volume of a cube with 3.24 meters on a side. The concentrator elements are sized for a geometric concentration ratio (GCR) of six with an aperture area of 0.5 meters x 0.5 meters. Drawings for the preliminary design configuration and for the test hardware that was fabricated for design evaluation and test are provided. Author

N83-36099# Boeing Aerospace Co., Seattle, Wash.
HIGH VOLTAGE DESIGN GUIDE. VOLUME 5: SPACECRAFT Final Report, 29 Sep. 1979 - 5 Jan. 1983
W. G. Dunbar Wright-Patterson AFB, Ohio AFWAL Jan. 1983 141 p refs
(Contract F33615-79-C-2067; AF Proj. 3145)
(AD-A129142; AFWAL-TR-82-2057-Vol-5) Avail: NTIS

HC A07/MF A01 CSCL 22/2

This report supplies the technical background and design techniques needed by an engineer who is designing electrical insulation for high-voltage, high-power components, equipment, and systems on spacecraft. The data in this volume is in addition to the material in Volume 4 of the final report 'High Voltage Design Guide: Aircraft' which is common to the electrical insulation design for both aircraft and spacecraft equipment. The common data includes testing, tracking, partial discharges and corona. Unique material involves the semi vacuum environment, spacecraft charging, and multipactor. Author (GRA)

N83-36100# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
MODIFICATIONS TO ACOSS MODEL NUMBER 2 DESIGN Final Technical Report, Sep. - Dec. 1981
Timothy C. Henderson Griffiss AFB, N.Y. RADC Mar. 1983 71 p refs
(Contract F30602-81-C-0180; ARPA Order 3655)
(AD-A129701; CDSL-R-1585; RADC-TR-83-56) Avail: NTIS HC A04/MF A01 CSCL 22/2

An updated version of the Active Control of Space Structure (ACOSS) Evaluation Model, ACOSS Model 2, has been designed and analyzed. This updated model reflects the need for closer correlation between model performance and actual system performance at the cost of increased model complexity. Using this updated model, two additional models have been created to fulfill the needs of the VCOSS program. The first VCOSS model is a minimum mass, flexible design. A vibration control system including hardware specifications will be designed for this model. This design will be compared with that based on the second VCOSS model. This model is a maximum mass, stiffness controlled design. The purpose of this design is to reduce control system requirements by stiffening the structure in order to raise critical modal frequencies. The MSC/NASTRAM finite element models for all three designs are listed in the appendices.
Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-36101*# Rocketdyne, Canoga Park, Calif.
SSME MAIN COMBUSTION CHAMBER LIFE PREDICTION Final Report, Jan. 1982 - May 1983
R. T. Cook, E. E. Fryk, and J. F. Newell May 1983 294 p refs
(Contract NAS3-23256)
(NASA-CR-168215; NAS 1.26:168215; RI/RD83-150) Avail: NTIS HC A13/MF A01 CSCL 21H

Typically, low cycle fatigue life is a function of the cyclic strain range, the material properties, and the operating temperature. The reusable life is normally defined by the number of strain cycles that can be accrued before severe material degradation occurs. Reusable life is normally signified by the initiation or propagation of surface cracks. Hot-fire testing of channel wall combustors has shown significant mid-channel wall thinning or deformation during accrued cyclic testing. This phenomenon is termed cyclic-creep and appears to be significantly accelerated at elevated surface temperatures. This failure mode was analytically modelled. The cyclic life of the baseline SSME-MCC based on measured calorimeter heat transfer data, and the life sensitivity of local hot spots caused by injector effects were determined. Four life enhanced designs were assessed. S.L.

N83-36102*# Computer Genetics Corp., Wakefield, Mass.
THE LIDAR (LIGHT DETECTION AND RANGING) REMOTE MEASUREMENTS OF STS-3 GROUND CLOUD EMISSIONS Final Report, Mar. - Apr. 1982
Bernard Caputo, Richard Johnson, and Robert Dow Apr. 1983 107 p refs
(Contract NAS10-10299; AF Proj. 1900)
(NASA-CR-173094; NAS 1.26:173094; AD-A130515; AFESC/ESL-TR-82-52) Avail: NTIS HC A06/MF A01 CSCL 17H

Under joint sponsorship by NASA and the USAF, Computer Genetics Corporation demonstrated the feasibility of lidar (Light Detection and Ranging) remote sensing techniques for the characterization of booster exhaust clouds produced by STS operations. Analysis of data performed shows that the mobile lidar test bed can successfully track ground clouds from an observation point greater than 7 kilometers distant and acquire cloud main body and fallout particulate backscatter data which can be correlated to geographical footprints. The STS-3 launch measurements demonstrated the practical feasibility of lidar to provide accurate information for evidentiary challenge, health and environmental studies, and model development. Author (GRA)

N83-36103# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLID ROCKET ENGINE TEST MEASURING TECHNIQUES
23 May 1983 291 p Transl. into ENGLISH of the mono. "Gu Ti Huo Jian Fa Dong Ji Shi Yan Ce Liang Ji Shu" China, Mar 1976 p 1-164
(AD-A130091; FTD-ID(RS)T-0174-83) Avail: NTIS HC A13/MF A01 CSCL 14/2

Aside from measuring the thrust pressure using conventional tests in solid rocket engine testing, the combustion temperature and time are determined. Various high speed photographic methods for measuring and analysis are used. In related corrosion property tests, various plans to determine the local combustion speed of the propellant are used. In researching unstable combustion phenomena, it is necessary to use very fast speeds to measure and observe the changing conditions, etc., of various parameters. The parameters which must be measured are different and the measuring instruments and measuring methods are also different. The parametric measuring introduced has engine thrust (F), combustion chamber (P sub o) and wall temperature (T sub w). Aside from these, there are also certain requirements for the precision time measurement in the solid rocket engine tests. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N83-36104# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
MULTIPLE MELTING POINTS OF cis-1,4 POLYISOPRENE
S. K. Kurljand 1982 4 p refs Transl. into ENGLISH from Kaucuk i Rezina (USSR), v. 7, 1981 p 57-58
(CSIR-Trans-1641) Avail: NTIS HC A02/MF A01

Two melting temperatures occur during the melting of cis-1,4 polyisoprene crystallized under given temperature and deformation conditions. Three deformation ranges similar to the morphology change ranges were observed in natural rubber (NR) films. Ranges of slight deformation characterized by a single melting temperature according to a lamellar electron-micrographic structure with folded

chains were encountered. Two deformation temperatures were observed in the mean deformation range. A high melting temperature was observed in the region of major deformations, associated with the formation and melting of crystallic structures of the fibril type with elongated chains. The crystallization of SKI-3 in the temperature ranges and deformations investigated is completed by the formation of "shish kebab" type structures. The lower melting temperatures of SKI-3 crystallized structure in comparison with NR are explained by the somewhat lower degree of molecular orientation, corresponding to structural differences. A.R.H.

N83-36105# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF OLIGOESTER EPOXIDES ON THE STRUCTURE AND PROPERTIES OF cis-1,4 POLYISOPRENE
A. G. Svarc 1982 10 p refs Transl. into ENGLISH from Kaucuk i Rezina (USSR), no. 7, 1981 p 26-29
(CSIR-Trans-1645) Avail: NTIS HC A02/MF A01

Filled and unfilled rubber mixtures containing E-49 epoxy resins (based on diphenylolpropane) and ARE-1 (based on alkylresorcin) differing in the type of original phenol but with very similar numbers of epoxy groups were tested. Type PM-100 active technical carbon and type DG-100 oxidized technical carbon were used as fillers. Results indicate that the modifying action of OEE in rubbers based on SKI-3 and filled with PM-100 technical carbon is due to intensification of the physical interaction in the rubber-filled system. The absorptive bonds produced during the mixing and vulcanization of the experimental mixtures facilitate uniform stress distribution, thus increasing reinforcement index and fatigue and wear resistance. These conditions are simulated in accordance with the fatigue mechanism and wear resistance of the rubber. Study of the changes in the properties of rubber mixtures and vulcanizates containing E-49 and ARE-1 resins indicate that these additives are active only in filled rubbers. A.R.H.

N83-36106# Naval Weapons Center, China Lake, Calif. Public Works Dept.
MATERIALS AND ELECTRONIC EQUIPMENT CORROSION TESTS IN SOME U.S. NAVY GEOTHERMAL ENVIRONMENTS Progress Summary Report, Feb. 1978 - Dec. 1980
C. Rodgers, S. Finnegan, and K. Graham Mar. 1983 44 p refs
(AD-A126355; NWC-TP-6393) Avail: NTIS HC A03/MF A01 CSCL 11/6

Samples of duriron cast iron, 316L stainless steel, unalloyed titanium, carbon steel coated with Teflon, and glass reinforced epoxy in tubular shapes were tested for approximately 17 months in two different types of low-pressure, medium-temperature steam environments. In addition, a variety of electronic equipment including aircraft instrumentation and battery-powered test circuits were exposed to a hydrogen-sulfide-rich environment at the Devils Kitchen area for approximately 2 years. At Fallon, standard corrosion coupons of 11 different metals and alloys and some plastic cement samples were exposed to fluids in a deep brine well for three different time intervals up to 109 days (a planned-interval test series). Exposed samples were analyzed using a variety of methods including optical microscopy, X-ray diffraction techniques, and weight-loss measurements. Corrosion rates, modes, and various corrosion products and precipitates were established for the individual coupons and the tubular specimens, while the electronic instruments and test circuitry were given an operational and bench test before and after exposure and were also visually inspected. Test circuits (and one electronic instrument) were also periodically removed and tested. Results are discussed. Author

N83-36107# Los Alamos Scientific Lab., N. Mex.
COHERENT RAMAN SCATTERING MEASUREMENTS OF VIBRATIONAL FREQUENCY SHIFTS IN SHOCK-COMPRESSED ORGANIC LIQUIDS
David S. Moore, S. C. Schmidt, D. Schiferl, and J. W. Shaner 1983 6 p refs Presented at the Conf. on Optics '83, Los Alamos, N. Mex., 11 Apr. 1983
(Contract W-7405-eng-36)
(DE83-011331; LA-UR-83-1024; CONF-830425-11) Avail: NTIS HC A02/MF A01

The techniques of backward stimulated Raman scattering (BSRS) and reflected broad-band coherent anti-Stokes Raman scattering (RBBCARS) were used to measure vibrational frequency shifts in shock-compressed liquid benzene and mixtures of liquid benzene and liquid deuterated benzene. ESRS was used only for measurements in neat liquid benzene as it only allows observation of the highest gain vibrational transition. RBBCARS was used to simultaneously measure multiple vibrational modes of multiple species. Accompanying static high pressure Raman experiments in a heated diamond anvil cell were used to establish the phase of the shocked samples. These experiments demonstrate the capabilities of fast nonlinear optical techniques in the study of material structure and chemical reaction induced by shock-compression. DOE

N83-36108# National Materials Advisory Board, Washington, D.C.
ANALYTICAL TECHNIQUE FOR STUDYING SUBSTITUTION AMONG MATERIALS Final Report
Sep. 1982 190 p refs
(Contract DI-BM-JO199138)
(PB83-215947; NMAB-385) Avail: NTIS HC A09/MF A01 CSCL 08I

The available analytical modeling techniques are assessed for their utility in treating and interpreting the mechanisms of materials substitution. The techniques are classified under eight categories: extrapolation, case studies, optimization, econometrics, input/output, simulation, judgmental studies, and engineering studies. Invited papers on the techniques were presented and discussed at a workshop. The potential of the available techniques for expanding our ability to treat and manage the substitution of one material for another are outlined. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N83-36109*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARACTERISTICS OF THERMALLY-INDUCED TRANSVERSE CRACKS IN GRAPHITE EPOXY COMPOSITE LAMINATES
Daniel S. Adams (Virginia Polytechnic Inst. and State Univ., Blacksburg), David E. Bowles, and Carl T. Herakovich (Virginia Polytechnic Inst. and State Univ., Blacksburg) Jun. 1983 134 p refs
(Contract NCC1-15)
(NASA-TM-85429; NAS 1.15:85429; VPI-F-83-23) Avail: NTIS HC A07/MF A01 CSCL 11D

The characteristics of thermally induced transverse cracks in T300/5208 graphite-epoxy cross-ply and quasi-isotropic laminates were investigated both experimentally and analytically. The formation of transverse cracks and the subsequent crack spacing present during cool down to -250 F (116 K) and thermal cycling between 250 and -250 F (116 and 394 K) was investigated. The state of stress in the vicinity of a transverse crack and the influence of transverse cracking on the laminate coefficient of thermal expansion (CTE) was predicted using a generalized plane strain finite element analysis and a modified shear lag analysis. A majority of the cross-ply laminates experienced transverse cracking during the initial cool down to -250 F whereas the quasi-isotropic laminates remained uncracked. The in situ transverse strength of the 90 degree layers was more than 1.9 times greater than the transverse strength of the unidirectional 90 degree material for all laminates investigated. Author

N83-36110# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
ULTRASONIC NON-DESTRUCTIVE TESTING OF COMPOSITE MATERIALS Final Report, 1 Aug. 1978 - 28 Feb. 1982
Wolfgang Sachse and Yih-Hsing Pao Feb. 1983 55 p refs
(Contract F49620-78-C-0100; AF Proj. 2307)

(AD-A126380; AFOSR-83-0150TR) Avail: NTIS HC A04/MF A01 CSCL 14/2

Work completed on a project utilizing ultrasonic wave dispersion, frequency-dependent velocities and attenuation measurements in a variety of composite materials is summarized. Various measurement techniques are discussed and results obtained using each of the techniques on various composite specimens and pure epoxy matrix only are compared. A technique for monitoring the microstructural changes accompanying the mechanical deformations and thermal cyclings of a composite specimen is investigated. The measurements from 1 to 10 MHz clearly show an increase in attenuation; however, the variation from specimen to specimen and between the values obtained with the various techniques is greater than the microstructurally induced attenuation changes. The effects on the dispersion curve and the frequency-dependent velocity data is less than the variation measured from specimen to specimen. A.R.H.

N83-36111# Naval Postgraduate School, Monterey, Calif. Research Dept.

A WORKING MODEL FOR THE SYSTEM ALUMINA-MAGNESIA Final Report, 1978 - 1982

Richard A. Reinhardt China Lake, Calif. NWC May 1983 21 p refs

(WF32300000)

(AD-A128709; NWC-TP-6433) Avail: NTIS HC A02/MF A01 CSCL 12/1

For treatment of internal explosions in the presence of both Mg and Al metals, it was necessary to devise a working model for the system magnesia-alumina. From the parameters of the model it was then possible to estimate equilibrium and internal-energy data for the various chemical species present in the oxide system, both in solid and liquid phases, for use in the blast computations. The solid phases, in agreement with published phase diagrams, consist of: a magnesia phase, in which a small amount of spinel (magnesium aluminate) dissolves; a spinel phase in which either magnesia or alumina is soluable to a considerable extent; and a pure alumina phase. The solid phases were treated by the methods of the thermodynamics of non-ideal solutions. The melt was assumed to contain chemically reasonable ions, plus unionized MgO, and to behave as an ideal solution. The parameters of the model were adjusted to give the most satisfactory fit to the known phase diagram. It is emphasized that the model does not purport to be an actual explanation of the structure of the system. Author (GRA)

N83-36112# Universal Energy Systems, Inc., Dayton, Ohio.

AN APPLE COMPUTER PROGRAM FOR THE ANALYSIS OF COMPOSITE LAMINATES Technical Report, Oct. - Dec. 1982

Herzl Chai Wright-Patterson AFB, Ohio AFWAL Mar. 1983 34 p

(Contract F33615-82-C-5001; AF Proj. 7801)

(AD-A130077; AFWAL-TR-83-4041) Avail: NTIS HC A03/MF A01 CSCL 11/4

The proposed numerical code which is based on lamination plate theory is capable of determining characteristics of general laminates with cores. The laminate may be subjected to mechanical or hygrothermal loadings. The main features of this program are: calculating stiffness and compliance matrices; calculating effective stresses and moments resulting from temperature or moisture content change; calculating on-axis and off-axis interlaminar strains arising from mechanical or hygrothermal effects, and conducting strength analysis using the Tsai-Hill or maximum strain criterion. GRA

N83-36113# Factory Mutual Research Corp., Norwood, Mass.

PRESSURE MODELLING OF CHAR-FORMING AND LAMINATED MATERIALS Final Report, Apr. 1981 - Nov. 1982

R. L. Alpert Atlantic City FAA Jun. 1983 114 p refs

(Contract DTFA03-81-C-0043)

(AD-A130070; OGON3-BU; RC-82-BR-6; FAA-CT-83-24) Avail: NTIS HC A06/MF A01 CSCL 11/4

The pressure modeling technique is used to study upward fire spread on fuel wall composed of char-forming or laminated materials. Time-resolved measurements are obtained at one-atmosphere (full-scale) and at elevated air pressure (model scales) to characterize fire growth in terms of rate of total mass loss, flame height, upward flame spread rate, and maximum lateral flame dimensions during the spread process. The char-forming materials (pine-wood, particular-board and a rigid, polyurethane foam) are tested in a 90 deg. wall-corner configuration while the laminated materials (PMMA in combination with PMMA or ceramic backings) are tested in a wall configuration. Thermally-thick PMMA is tested in both configurations for purposes of comparison. Results are generally consistent with the pressure modeling scheme and a series of one-dimensional, transient thermal conduction and pyrolysis calculations. The behavior of the rigid polyurethane foam, however, is an exception. This material does not support self-sustained upward flame spread at one-atmosphere when exposed to flames from a 0.1 m high PMMA ignition source but does not support rapid fire growth at elevated pressures. A possible reason for the anomalous polyurethane behavior is the intumescent structure of the hot char at one-atmosphere, but a better understanding of the mechanism of upward or wind-aided flame spread on charring materials is needed to resolve the issue. GRA

N83-36114# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.

MECHANICS OF COMPOSITE MATERIALS DIRECTORY

Lisa Wilson Apr. 1983 199 p refs

(AD-A130061) Avail: NTIS HC A09/MF A01 CSCL 11/4

This is a first attempt to compile the background and interests of those who are active in the mechanics of composite materials. As applications of composite materials expand, it is felt that an updated directory of the key personnel in this specialty field will promote effective communications and smooth technology transitioning. The roster will be based in part on the participants of the annual Mechanics of Composites Review supported by various units of the Air Force, NASA, Navy and Army. The information in each entry includes name, date and place of birth, academic background, current position, current interests, office and home address, and telephone number. GRA

N83-36115# Carnegie-Mellon Inst. of Research, Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

STRUCTURAL AND KINETIC PROPERTIES OF GRAPHITE INTERCALATION COMPOUNDS Final Report, 1 Mar. 1978 - 28 Feb. 1983

Deborah D. L. Chung 29 Apr. 1983 185 p refs

(Grant AF-AFOSR-3536-78; AF Proj. 2306)

(AD-A129579; AFOSR-83-0532TR) Avail: NTIS HC A09/MF A01 CSCL 07/4

An extensive investigation was undertaken on the mechanism, kinetics and thermodynamics of intercalation of graphite. It was found that bromine intercalate transport in graphite at room temperature occurred by solid-state intercalate displacement. Upon exposure by stage-2 graphite-bromine to IC1, bromine was expelled by the incoming IC1, which dissolved the remaining bromine to form a solid solution with the IC1 in-plane superlattice. During bromine intercalation, an intercalate front moved toward the center of the graphite. The first time-temperature-transformation (TTT) diagram describing the stage evolution during intercalation was obtained. The TTT-curves for bromine intercalation were C-shaped for the growth of each stage, suggesting diffusion-controlled kinetics at low temperatures and interface-controlled kinetics at high temperatures. The pressure-temperature equilibrium diagram for stages 2-4 of graphite-bromine was determined. Based on the change in free energy from stage of stage and the intercalate diffusion rate, the kinetics of bromine intercalation of graphite was modeled. GRA

N83-36116# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

FIBROUS CARBON-METALLIC MATERIALS AND A METHOD OF MANUFACTURING CARBON-METALLIC FIBROUS MATERIALS

Roman Swierczek, Kazimierz Skoczkowski, Josef Gonsior, Hanna Kossobudzka, and Anna Piasecka-Herud 12 May 1983 9 p Transl. into ENGLISH of Polish Patent no. 110833 (3 Jul. 1978) p 1-3
(AD-A129362; FTD-ID(RS)T-0305-83) Avail: NTIS HC A02/MF A01 CSCL 13/8

A carbon substance covered with metal in the form of a composition containing various forms of fibrous materials, such as fabric, knitted fabric, unwoven fabric, yarn, cable, and metal, and a method of manufacturing the carbon-metallic fibrous materials by means of reduction without current of metal ions in an aqueous medium is discussed. The carbon-metallic fibrous materials constitute a composition composed of fabric where the thickness of the metallic layer is less than the diameter of the elementary fibers, and the metal content of the composition is no less than 3% by weight. The method of manufacturing the carbon-metallic fibrous materials includes an initial activation treatment followed by a reduction of metal ions without current in an aqueous medium. Short-live polarization is used as the initial activation treatment: anodic and cathodic polarization with a unidirectional or asymmetrical current. GRA

N83-36117# Pacific Northwest Lab., Richland, Wash.
EFFECT OF COATING STRUCTURE ON THE ADHERENCE OF SPUTTER-DEPOSITED OXIDE COATINGS
J. T. Prater and R. W. Moss Apr. 1983 15 p refs Presented at the Met. Coatings Conf., San Diego, Calif., 18 Apr. 1983
(Contract DE-AC06-76RL-01830)
(DE83-011804; PNL-SA-10842; CONF-830443-3) Avail: NTIS HC A02/MF A01

Evaluation of ceramic coatings with graded metal-to-ceramic transition zones and columnar ceramic structures were completed. The ceramic materials investigated were ZrO2.20 Y2O3, ZrO2.8 Y2O3 and Al2O3.40 Cr2O3 deposited over NiCrAlY and CoCrAlY bond layers. Dense ceramic closeout layers were deposited over the columnar ceramic to reduce coating permeability. The majority of the zirconia coatings failed as a result of massive diffusion of aluminum (MCrAlY) and oxygen (ZrO2) in the graded metal-ceramic layer. Coating fracture occurred very low in the graded transition zone where a band of Al2O3 and voids formed. These acted as a preferred path for crack propagation. For this reason, the ZrO2 coating which had no graded transition zone performed best in thermal cycling experiments. Graded Al2O3 - CoCrAlY layers were less affected by interdiffusion. However, deposition of ceramic layers of Al2O3.40 Cr2O3 or ZrO2.20 Y2O3 over graded Al2O3 - CoCrAlY layers displayed poor adherence. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N83-36118* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE EXTINGUISHANT MATERIALS Patent
Robert L. Altman (San Jose State Univ., Calif.), Ludwig A. Mayer (San Jose State Univ., Calif.), and Alan C. Ling, inventors (to NASA) (San Jose State Univ., Calif.) Issued 27 Sep. 1983 3 p Filed 3 Nov. 1981 Supersedes N82-12168 (20 - 03, p 0308) Sponsored by NASA
(NASA-Case-ARC-11252-1; US-Patent-4,406,797; US-Patent-Appl-SN-317977; US-Patent-Class-252-5; US-Patent-Class-169-47; US-Patent-Class-252-2) Avail: US Patent and Trademark Office CSCL 07D

Fire extinguishant composition comprising a mixture of a finely divided aluminum compound and alkali metal, stannous or plumbous halide is provided. Aluminum compound may be aluminum hydroxide, alumina or boehmite but preferably it is an alkali metal dawsonite. The metal halide may be an alkali metal, e.g. potassium iodide, bromide or chloride or stannous or plumbous iodide, bromide or chloride. Potassium iodide is preferred.
Official Gazette of the U.S. Patent and Trademark Office

N83-36119*# National Aeronautics and Space Administration. Pasadena Office, Calif.
TOWER EVAPORATOR Patent Application
Eugene R. duFresne, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 19 Apr. 1983 20 p
(Contract NAS7-100)
(NASA-Case-NPO-15609-1; US-Patent-Appl-SN-511363) Avail: NTIS HC A02/MF A01 CSCL 07D

Liquids, such as juices, milk, molten metal and the like are concentrated by forming uniformly sized, small droplets in a precision droplet forming assembly. The droplets are displayed in free fall downwardly as a central column within an evacuated tower with cool walls. A portion of the solvent evaporates. The vapor flows to the wall, condenses, and usually flows down the wall as a film to condensate collector and drain. (In special cases, the condensate may be frozen on the wall, and stripped from it as a solid.) The vertical column of freely falling droplets enters the splash guard. The condensate can be collected, sent to other towers or recycled. NASA

N83-36120*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIZED BED COAL LIQUEFACTION Patent Application
Shaik A. Qader, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 30 Jun. 1983 24 p
(Contract NAS7-100)
(NASA-Case-NPO-15891-1; US-Patent-Appl-SN-526740) Avail: NTIS HC A02/MF A01 CSCL 07D

Coal is catalytically hydropyrolyzed at temperatures of 500 C to 700 C and pressures of 1000 psi to 4000 psi to form a liquefied product comprising gasoline and middle distillate fuel and diesel oils by forming a fluidized bed of coal in hot hydrogen or hydrogen steam gas fed into the bottom inlet of a reactor. Catalyst particles shower downwardly through the upper hydrorefining zone and lower liquefaction zone and are collected in an engager before recycle. As the catalyst particles contact the coal particles within the liquefaction zone in the presence of hydrogen, the coal dissolves to form vapors which rise and are hydrocracked and refined to the upper zone before being swept out the outlet by the hot carrier gas. NASA

N83-36121*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIZED BED LIQUEFACTION OF BIOMASS Patent Application
Shaik A. Qader, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Aug. 1983 25 p
(Contract NAS7-100)
(NASA-Case-NPO-15907-1; US-Patent-Appl-SN-526832) Avail: NTIS HC A02/MF A01 CSCL 07D

Biomass particles are dried and pelletized. The pellets are catalytically hydropyrolyzed at temperatures of 500 C to 700 C and pressures of 1000 to 4000 psi to form a liquefied product comprizing gasoline and middle distillate fuel and diesel oils. The pellets form a fluidized bed of biomass in hot hydrogen or hydrogen synthesis gas fed into the bottom inlet of a reactor. Catalyst particles shower downwardly through the upper hydrorefining zone and lower liquefaction zone and are collected before recycle. As the catalyst particles contact the biomass particles within the liquefaction zone in the presence of hydrogen, the biomass dissolves to form vapors which rise and are hydrocracked and refined in the upper zone. NASA

N83-36122*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIZED BED DESULFURIZATION Patent Application
Maddury Ravindram (JPL, California Inst. of Tech., Pasadena) and John J. Kalvinskas, inventors (to NASA) (JPL, California Inst. of

Tech., Pasadena) Filed 30 Jun. 1983 44 p
(Contract NAS7-100)
(NASA-Case-NPO-15924-1; US-Patent-Appl-SN-526768) Avail: NTIS HC A03/MF A01 CSCL 07D

High sulfur content carbonaceous material, such as coal, is desulfurized by continuous fluidized suspension in a reactor with chlorine gas, inert dechlorinating gas, and hydrogen gas. A source of chlorine gas, a source of inert gas and a source of hydrogen gas are connected to the bottom inlet through a manifold and a heater. A flow controller operates servos in a manner to continuously and sequentially suspend coal in the three gases. The sulfur content is reduced at least 50% by the treatment. NASA

N83-36123# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
RESEARCH INTO PRODUCT STRUCTURE OF OXYGEN WITH ETHYLENE REACTIONS [UNTERSUCHUNGEN ZUR PRODUCKTBILDUNG IN DER REAKTION VON SAUERSTOFFATOMEN MIT ETHYLEN]
F. Temps and H. Gg. Wagner Dec. 1982 20 p refs In GERMAN
(Rept-18/1982) Avail: NTIS HC A02/MF A01

The relative importance of the channel O + C2H2 yields CH3 + HCO in the reaction of oxygen atoms with ethylene was determined at room temperature in an isothermal discharge flow reactor with helium as carrier gas. The O-atoms and HCO-radicals were monitored by means of a lmr-spectrometer. The sensitivity was determined directly before or after the measurements using different methods. For the concentrations of ethylen and reaction times used the O-consumption was nearly complete. Consecutive reactions played no role. The HCO-consumption which is due to reactions with other products and with O2 was negligible. The contribution of the channel resulted from the ratio of the concentrations of HCO formed and O consumed. Author

N83-36124*# California Inst. of Tech., Pasadena.
SHOCK-WAVE PROPERTIES AND HIGH-PRESSURE EQUATIONS OF STATE OF GEOPHYSICALLY IMPORTANT MATERIALS Ph.D. Thesis
Mark Bruce Boslough 1983 178 p refs Sponsored by NASA and NSF
(NASA-CR-174454; NAS 1.26:174454) Avail: NTIS HC A09/MF A01 CSCL 07D

Shock wave (Hugoniot), shock temperature, and release data are presented for several geophysically important, refractory materials. A sensitive multichannel optical pyrometer was developed to measure shock temperatures (2500 to 5600 K at pressures from 48 to 117 GPa) in anorthite (CaAl2Si2O8) glass. Shock temperatures of 3750 to 6000 K at pressures from 140 to 182 GPa were measured in calcium oxide (CaO). Temperature data were used to constrain the energetics of the B1-B2 phase transition at 70 GPa in CaO, and to construct a finite strain equation of state for CaO consistent with previous Hugoniot data. The CaO equation of state was used with equation of state parameters of other oxides to construct a theoretical mixed oxide Hugoniot of anorthite, which is in agreement with new Hugoniot data above about 50 GPa, determined using experimental techniques developed. The mixed oxide model, however, overestimates the shock temperatures, and does not accurately predict measured release paths. S.L.

N83-36125# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
SPECTROSCOPY AND CHEMISTRY OF MOLECULES WITH HIGH VIBRATIONAL ENERGY CONTENT Final Report
Jeffrey I. Steinfeld 15 Oct. 1982 5 p refs
(Grant AF-AFOSR-3725-78; AF Proj. 2302)
(AD-A126375; AFOSR-83-0123TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Research was performed on the reactivity, spectroscopy, and dynamics of vibrationally excited small polyatomic molecules. Infrared multiple photon excitation of chlorocyclobutane, chloroethane, and other species was investigated. Laser-induced fluorescence excitation spectroscopy was used to probe vibrational distributions following IRMPE in thiophosgene. Master Equation and Block Equation calculations were used to analyze experimental results. GRA

N83-36126# Argonne National Lab., Ill.
HIGH-RESOLUTION SPECTROSCOPY AND DYNAMICS OF MULTIPHOTON PROCESSES IN ATOMS AND MOLECULES Annual Summary Report, 1 Jun. 1982 - 30 Sep. 1983
Patricia M. Dehmer and Joseph L. Dehmer 15 Jun. 1983 12 p refs
(Contracts N00014-82-F-0074; N00014-83-F-0001)
(AD-A129120) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report summarizes research to establish the high-resolution spectroscopy and detailed mechanisms of sequences of resonant transitions induced in atoms and molecules by multicolor, multiphoton excitation. These processes are studied as a function of the independently tunable frequencies and polarization states of multiple dye laser beams in order to establish both the underlying physics and the high degree of selectivity of this advanced form of laser excitation. Detection methods include photoelectron analysis, mass spectrometry, and laser-induced fluorescence. During this period, all instrumentation needed for this research was put into full operation and was used to examine multiphoton ionization processes in H2, CO, and N2. For example, a novel, totally-state-selected process was studied in H2 in which a single rotational, vibrational level of the target gas was excited by three-photon excitation to a single rotational, vibrational level of the B 1 epsilon u state of H2, followed by single-photon ionization. The ejected electrons were then energy analyzed with rotational resolution, yielding the first rotationally resolved study of photoionization of an excited molecular state. Multicolor studies are now beginning, and an improved electron spectrometer system is being developed to greatly enhance the resolution/sensitivity of these studies. GRA

N83-36127# Ballistic Research Labs., Aberdeen Proving Ground, Md.
STRAND BURN RATES OF BLACK POWDER TO ONE HUNDRED ATMOSPHERES
Ronald A. Sasse May 1983 37 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A129087; AD-F300253; ARBRL-TR-02490) Avail: NTIS HC A03/MF A01 CSCL 19/1

Black powder samples were compressed into parallelepipeds of several different densities. Strand burn rates of these samples were determined by high-speed cinematography at constant pressures to 100 atmospheres. The rate can be represented as r = 1.72 p0.164, with the regression rate, r, in cm/sec and pressure, p, in atmospheres. High-speed movies, 2000 frames per second, showed the combustion mode, droplet-particle formation, and images that were used to derive both surface and strand burn rates. Compaction of black powder meal was found to be in a linear logarithmic function of applied pressure, where samples of different moisture content formed a family of parallel lines. This same functional relationship was found when compressing grains of black powder and copper spheres. This similarity suggests the same physical processes are occurring in both materials where compaction results in plastic flow among a collection of close packed spheres. GRA

N83-36128# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THIN FILM GAGES FOR IGNITION AND COMBUSTION EXPERIMENTS Final Report
William F. McBratney May 1983 37 p refs
(DA Proj. 1L1-61102-AH-60)
(AD-A129086; AD-F300259; ARBRL-MR-03272) Avail: NTIS HC A03/MF A01 CSCL 21/2

Thin film gages are of use in studies on the ignition and combustion of gas propellants. The work described in this report covers fabrication and calibration techniques for thin film gages on several substrates. These gages are intended to determine

heat flux values in an experiment on the convective ignition of solid propellants. GRA

N83-36129# Purdue Univ., Lafayette, Ind. Thermophysical and Electronic Properties Information Analysis Center.
ELECTRICAL RESISTIVITY OF CHROMIUM, COBALT, IRON AND NICKEL
T. K. Chu and C. Y. Ho Jun. 1982 177 p refs Sponsored in part by NBS
(AD-A129078; CINDAS-60) Avail: NTIS HC A09/MF A01 CSCL 07/2

This work compiles, reviews, and discusses the available data and information on the electrical resistivity of chromium, cobalt, iron, and nickel and presents the recommended values resulting from critical evaluation, correlation, analysis, and synthesis of the available data and information. The recommended values presented are uncorrected and also corrected for the thermal expansion of the material and cover the temperature range from 1 K to above the melting point into the molten state. The estimated uncertainties in most of the recommended values are about + minus 5%. GRA

N83-36130# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
ROTATIONAL ENERGY TRANSFER IN HF
Roger L. Wilkins and Munson A. Kwok 16 May 1983 28 p refs
(Contract F04701-82-C-0083)
(AD-A130137; SD-TR-83-34; TR-0083(3603)-4) Avail: NTIS HC A03/MF A01 CSCL 07/4

A rotational nonequilibrium model has been developed to simulate the infrared double-resonance experimental technique designed to study rotational relaxation of HF gas in the v = 1 and higher vibrational states. State-to-state rate coefficients for this rotation-to-translation relaxation model have been obtained from a surprisal analysis and are found to scale as an inverse power of the rotational energy transferred. Phenomenological rates for the rotational energy transfer in the v = 1 state for J = 0 to J = 7 with delta J = +1, +2, +3, and +4 are found to be in excellent agreement with the reported phenomenological rates from available experiments for both the v = 1 and v = 2 states. It appears, therefore, that the state-to-state rate coefficients for rotational relaxation of HF are insensitive to v state. Angular momentum statistics corresponding to conservation of mj are found to give better fits to the data than those with mj assumed to be completely randomized. GRA

N83-36131# Arizona Univ., Tucson. Dept. of Chemistry.
SEPARATION OF ORGANOPHOSPHATE COMPOUNDS BY DYE-ASSISTED CHROMATOGRAPHY Interim Report
T. Gnanasambandan and H. Freiser Jun. 1983 16 p refs
(Contract N00014-81-K-0576)
(AD-A129961; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Dye-assisted, reversed phase, liquid chromatography has been applied to the separation of trace levels of a series of organophosphate compounds. Using dioxane-water mixtures containing 10-4M Brilliant Green as mobile phases and either Partisil-ODS or Lichrosorb-ODS columns. The chromatographic separation of phosphonates, phosphites, and phosphates were accomplished. Author (GRA)

N83-36132# Tennessee Univ., Knoxville. Dept. of Chemistry.
A SIMPLE PHOTOCHEMICAL CONVERSION OF PERFLUOROALKYL HYDRIDES TO PERFLUOROALKYL BROMIDES USING INTERHALOGEN COMPOUNDS Interim Report
James L. Adcock and William D. Evans 31 May 1983 20 p refs Submitted for publication
(Contract N00014-77-C-0685; NR Proj. 053-669)
(AD-A129960; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/5

The gas phase photolysis of mixtures of perfluoroalkyl hydrides and one or other of the interhalogen compounds bromine chloride or bromine fluoride as their equilibrium mixtures provides a simple route to perfluoroalkyl bromides in good yields. Author (GRA)

N83-36133# Rochester Univ., N. Y. Dept. of Chemistry.
PRODUCTION OF SHORT-WAVELENGTH (XUV) PHOTONS FROM ION-LASER-EXCITED-SURFACE CHARGE EXCHANGE: Li(3+), He(+) + Si(111) SYSTEMS Interim Report
Hai-Woong Lee (Oakland Univ.) and Thomas F. George Jun. 1983 10 p refs Submitted for publication Sponsored in part by ARO
(Contract N00014-80-C-0472; Grant AF-AFOSR-0046-82; NR Proj. 056-749)
(AD-A129958; UROCHESTER/DC/83/TR-35) Avail: NTIS HC A02/MF A01 CSCL 07/4

Semiclassical calculations are carried out for the probabilities of electron transfer for Li3+ and He+ ions colliding with a Si(111) surface, where a laser is used to excite electrons in silicon from the valence band to surface states. It is shown that with a moderate-power laser, high inversion densities of Li2+ and He+ can be obtained, as necessary for high gain. Author (GRA)

N83-36134# Rochester Univ., N. Y. Dept. of Chemistry.
STUDIES OF HYDROGEN PRODUCTION BY THE WATER GAS SHIFT REACTION AND RELATED CHEMISTRY Final Report, 1 Sep. 1980 - 31 Mar. 1983
Richard Eisenberg 15 Apr. 1983 18 p refs
(Contract DAAK70-80-C-0148)
(AD-A129920) Avail: NTIS HC A02/MF A01 CSCL 07/4

Many systems have been investigated for the catalysis of the water gas shift reaction, H2O + CO yields H2 + CO2, and for electrocatalytic oxidation of CO, CO + H2O yields CO2 + 2H+ +2e-. These systems have involved precious metal complexes composed of Pt, Rh, and Ir, and reaction conditions for these systems have been especially mild: atmospheric pressures and low temperatures (80-100 C). In addition aqueous acidic conditions for these systems have been pursued with particular interest in adopting water gas shift catalysts to act as electrocatalysts for the anode reaction of CO fuel cells. Under these conditions the best water gas shift catalysts observed have been PtCl42--SnC14-SnC14-SnC12, trans PtC12(SnC13)2-(SnC13)2-2, Rh(CO)2C12, Rh(CO)2C12-2, PtC12-4PbC12, and PtC13(C2H4)-. None of these electrocatalytically oxidized CO; however, RhC1(PPh3)3, Rh(dppe)(mnt)-, and Rh(dppe)2+, complexes known to bind CO, did exhibit some limited electrocatalytic CO oxidation behavior. Author (GRA)

N83-36135# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 10. FREE-BOUNDARY PROBLEMS Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 35 p refs
(Contract DAAG29-81-K-0127)
(AD-A129916; ARO-18243.26-MA; TR-155) Avail: NTIS HC A03/MF A01 CSCL 21/2

Throughout these lectures we have ensured that the reaction terms vanish everywhere except in a thin (flame) sheet, whose location has to be found as part of the solution. So far this free boundary has been either a plane, a circular cylinder, a sphere, or a perturbation of one of these; we now consider problems with more complicated free boundaries. Author (GRA)

N83-36136# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 9: SPHERICAL DIFFUSION FLAMES Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 27 p refs
(Contract DAAG29-81-K-0127)
(AD-A129915; ARO-18243.25-MA; TR-154) Avail: NTIS HC A03/MF A01 CSCL 21/2

Law has shown that the analysis of spherical diffusion flames is quite similar to that of counterflow diffusion flames, so that some explanation is needed for devoting a separate lecture to them. There are two good reasons. First, the constant-density approximation has been used throughout these lectures in discussing all but plane flames, so there is room for a problem which does not neglect variations in density. (Plane diffusion flames have to be chambered, i.e., the reactants must be supplied at

finite locations, which leads to distracting complications). Secondly, the spherical diffusion flame can lead to quite different (and unusual) responses. These arise in the technologically important application to the quasi-steady phase of fuel-drop burning, when a more realistic boundary condition than the conventional one is used. Author (GRA)

N83-36137# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURE ON MATHEMATICAL COMBUSTION. LECTURE 8: COUNTERFLOW DIFFUSION FLAMES Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 25 p ref
(Contract DAAG29-81-K-0127)
(AD-A129914; ARO-18243.24-MA; TR-153) Avail: NTIS HC A02/MF A01 CSCL 21/2

The fundamental characteristic of diffusion flames is that the two reactants, fuel and oxidizer, are supplied in different parts of the combustion field, so that they must come together and mix by diffusion before reaction can take place. Counterflowing streams provide one method of bringing them together; the resulting diffusion flames, whose main properties were established by Linan, is the subject of this lecture. GRA

N83-36138# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 7: PULSATING FLAMES Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 28 p refs
(Contract DAAG29-81-K-0127)
(AD-A129913; ARO-18243.23-MA-TR-152) Avail: NTIS HC A03/MF A01 CSCL 21/2

In section 5 it was found that plane NEFs to sufficiently large Lewis number are unstable. Since Im(a) 0 on the stability boundary, the instability is likely to result in either a pulsating flame or a flame that supports traveling waves. Such flames are the subject of this lecture. GRA

N83-36139# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 6: CELLULAR FLAMES Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 31 p refs
(Contract DAAG29-81-K-0127)
(AD-A129912; ARO-18243.22-MA; TR-151) Avail: NTIS HC A03/MF A01 CSCL 21/2

We shall now examine the left stability boundary that was uncovered in lecture 5 in our discussion of NEFs (figure 5.3). The boundary is associated with instabilities leading to cellular flames, i.e., flames whose surfaces are broken up into distinct luminous regions (cells) separated by dark lines. Each line is a ridge of high curvature, convex towards the burnt gas. For a nominally flat flame these cells are very unsteady, growing and subdividing in a chaotic fashion; but curvature, for example, can make stationary. GRA

N83-36140# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 5: STABILITY OF THE PLANE DEFLAGRATION WAVE Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 25 p refs
(Contract DAAG29-81-K-0127)
(AD-A129911; ARO-18243.21-MA; TR-150) Avail: NTIS HC A02/MF A01 CSCL 21/2

Steady, plane deflagration was introduced in the second lecture; here we shall consider infinitesimal perturbations of it and so examine its stability. We shall find two basic phenomena - the hydrodynamic and Lewis-number effects. GRA

N83-36141# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 3: GENERAL DEFLAGRATIONS Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 22 p
(Contract DAAG29-81-K-0127)
(AD-A129909; ARO-18243.19-MA; TR-148) Avail: NTIS HC A02/MF A01 CSCL 21/2

In the last lecture we examined the plane, steady, adiabatic, premixed flame and deduced an explicit formula for its speed. By using judicious choice of parameters this formula can be made to agree roughly with experiment; precision is not a reasonable goal, given the crude nature of our model. Noteworthy is the extreme sensitivity of the speed to variations in the flame temperature: an O(1) change generates an exponentially large change in flame speed. Such variations in speed (caused, for example, by changes in mixture strength) are not excessive numerically (at least for fuels burnt in air), because activation energies and fractional changes in temperature are modest; but in an asymptotic analysis they present a potential obstacle to discussion of multidimensional and/or unsteady flames. Then significant variations, spatial and/or temporal, in the flame temperature can be expected and, if the sensitivity mentioned above is any guide, there will be correspondingly large spatial and/or temporal variations in the flame speed. A mathematical framework in which to accommodate these is not obvious. (The first lecture dealt with special circumstances for which such variations were manageable). GRA

N83-36142# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 4: SVFS AND NEFS Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 25 p refs
(Contract DAAG29-81-K-0127)
(AD-A129910; ARO-18243.20-MA; TR-149) Avail: NTIS HC A02/MF A01 CSCL 12/1

For want of a complete analysis of multidimensional flows in preasymptotic days, it was natural to try to identify special characteristics that play particularly important roles in the understanding of flame behavior. Flame speed and temperature are examples of such characteristics that have already been identified; a more subtle characteristic, introduced by Karlovitz, is flame stretch. The authors start by discussing this concept, so as to have it available when we come to discussing general slowly varying and near-equidiffusional flames. Author (GRA)

N83-36143# Brown Univ., Providence, R. I. Dept. of Chemistry.
A FAR INFRARED STUDY OF IONIC INTERACTIONS IN POLYSTYRENE SULFONIC ACID IONOMERS
Vincent D. Mattera, Jr. and William M. Risen, Jr. 10 Mar. 1983 27 p refs
(Contract N00014-75-C-0883)
(AD-A130581; TR-83-04) Avail: NTIS HC A03/MF A01 CSCL 11/9

The far-infrared spectra of polystyrene sulfonic acid (PSSA) ionomer films containing alkali and alkaline earth ions have been studied, and strong, broad bands whose frequencies are cation-dependent, have been observed and assigned to cation-motion. The force field elements for cations vibrating at sulfonate-containing sites have been obtained for different models of the cation-motion vibration. The effects of hydration, dehydration and thermal annealing are discussed in light of ion-clustering in these materials. Author (GRA)

N83-36144# Brown Univ., Providence, R. I. Dept. of Chemistry.
THE CHEMISTRY OF METALS IN IONOMERS. REACTIONS OF RHODIUM-PSSA WITH CO, H2 AND H2O
Vincent D. Mattera, Jr., Philip J. Squattrito, and William M. Risen, Jr. 23 May 1983 27 p refs
(Contract N00014-75-C-0883)
(AD-A130582; TR-83-03) Avail: NTIS HC A03/MF A01 CSCL 07/3

Rhodium (III) ions have been incorporated in ionic domains of sulfonated linear polystyrene (PSSA) to form PSSA-Rh(III) films. The Rh-containing domains can act as isolated chemical reactors, and their chemical interactions have been explored in this work

by controlling the exposure of the rhodium sites to CO, H2 and H2O under mild conditions. Reaction with CO at low temperature, without either prior reduction by H2 or complete dehydration of the PSSA-Rh(III) film, resulted in production of a Rh(I) (CO)2 species. Partial or complete reduction of the films with H2, proceeded or followed by exposure to CO results in the cis-dicarbonyl and, under various conditions, linear and bridging PSSA-Rh(O) bonyls, and CO bound to Rh(O) particles. The implications of the results for catalysis are discussed. GRA

N83-36145# California Univ., Los Angeles. Dept. of Chemistry.
PHOTOCHEMISTRY AND PHOTOPHYSICS OF AQUEOUS Cr (NH3) 5 (CN) (2+) AND TRANS-C (NH3) 4 (CN) (2+)
Edoardo Zinato, Arthur W. Adamson, James L. Reed, Jean Pierre Puax, and Pietro Riccieri Jun. 1983 36 p refs
(Contract N00014-76-C-0548)
(AD-A129890; TR-20) Avail: NTIS HC A03/MF A01 CSCL 07/4

The emission lifetime, tao, and its temperature dependence is reported for aqueous Cr(NH3)5(CN)(2+) and trans-Cr(NH3)4(CN)(2+). The tao values at 20 C are 22 microseconds and 65 microseconds for pH 3 solution, respectively, and the corresponding activation energies are 1/11.2 kcal mole and 1/1.6 kcal mole. The results are discussed in terms of previously suggested emission rules. The emission, presumably from the lowest doublet thexi state is in both cases quenched by hydroxide ion at about a diffusion controlled rate. Author (GRA)

N83-36146# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
LECTURES ON MATHEMATICAL COMBUSTION. LECTURE 2: GOVERNING EQUATIONS, ASYMPTOTICS, AND DEFLAGRATIONS Interim Technical Report
J. D. Buckmaster and G. S. S. Ludford Jan. 1983 24 p
(Contract DAAG29-81-K-0127)
(AD-A129908; TR-147; ARO-18243.18-MA) Avail: NTIS HC A02/MF A01 CSCL 21/2

The problem of formulating the governing equations of combustion consists, as its simplest, in characterizing the flow of a viscous, heat-conducting mixture of diffusing, reacting gases. This is a formidable task that could fill a week of lectures by itself, most of which would not be of great interest to a mathematical audience. Mindful of this, we shall limit ourselves to a description, rather than a derivation, of the simplest equations that can be brought to bear on combustion problems. Only the most important assumptions normally used to justify the equations will be discussed; for a more extensive treatment the reader is referred to Buckmaster & Ludford (1982). GRA

N83-36147# New York Univ., New York. Dept. of Chemistry.
IR PHOTOACOUSTIC STUDIES OF SURFACE REACTIONS Final Report, 1 Jul. 1979 - 31 Mar. 1983
M. J. D. Low 20 May 1983 5 p refs
(Contract DAAD29-79-C-0135)
(AD-A129778; ARO-16631.18-CH; Rept-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

An infrared Fourier transform photothermal beam deflection spectrometer system was constructed and used to record spectra of solids. No sample preparation is needed. The surfaces of massive objects can be studied. The techniques are applicable to surface studies in which samples must be examined under rigorously controlled conditions. Details are given in 20 publications, which are listed. Author (GRA)

N83-36148# Texas A&M Univ., College Station. Dept. of Chemistry.
EFFECT OF HYDROPHOBIC INTERACTIONS ON THE RATES OF IONIC DIFFUSION IN NAFION FILMS AT ELECTRODE SURFACES
Charles R. Martin and Kathleen A. Dollard 7 Jul. 1983 29 p refs Presented at the ACS Natl. Meeting, Seattle, Mar. 1983 Submitted for publication Sponsored in part by the Robert A. Welch Foundation
(Contract N00014-82-K-0612; NR Proj. 627-838)
(AD-A130557; TR-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

Results of studies of diffusional charge transport in films of 1100 and 1200 equivalent weight Nafion on glassy carbon electrode surfaces are reported. A comparison of apparent diffusion coefficients for the oxidized and reduced forms of various ionically diffusing redox couples shows that the ratio of these diffusion coefficients is critically dependent on the nature of the diffusing ion. For hydrophobic redox couples, the diffusion coefficient for the more highly charged form was always greater than the diffusion coefficient for the lowor charge form (opposite of what is generally observed in aqueous solution). These results are interpreted in terms of the effect of hydrophobic interactions, with the polymer chain material. Author (GRA)

N83-36149# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapons Systems Lab.
METHODS FOR DETERMINING THE PERCENTAGE OF NITROGEN IN NITROCELLULOSE Final Report, Sep. 1981 - Apr. 1983
Anthony F. Taschler Jun. 1983 20 p refs
(AD-A130009; AD-E401027; ARLCD-TR-83025) Avail: NTIS HC A02/MF A01 CSCL 19/1

A round robin was conducted to statistically evaluate four chemical methods for determining the percentage of nitrogen in nitrocellulose. The four methods are: (1) nitrometer, (2) titanous chloride, (3) automatic ferrous sulfate titration, and (4) potentiometer ferrous sulfate titration. The nitrometer method was used as the standard and the other three were tested against it for equivalency. Automatic titration proved to be equivalent, while potentiometer titration has equivalency potential given more experience in and further development of the technique. The titanous chloride method is not equivalent to the nitrometer because the variance is too high. GRA

N83-36150# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.
HIGH PERFORMANCE LIQUID CHROMATOGRAPHY ANALYSIS OF ALKYL METHYLPHOSPHONIC ACIDS BY DEPRIVATIZATION Technical Report, Jan. - Aug. 1980
May 1983 18 p refs
(DA Proj. 1T1-61101-A-91)
(AD-A130010; AD-E410713; ARCSL-TR-83002) Avail: NTIS HC A02/MF A01 CSCL 07/2

This work describes a new and sensitive technique for the analysis of alkyl methylphosphonic acids. Ethyl methylphosphonic acid, isopropyl methylphosphonic acid, and pinacolyl methylphosphonic acid are derivatized to novel chromophore-bearing p-bromophenacyl esters separately and in a combined mixture. These are then separated by reverse phase HPLC and quantitated by UV detector response. The presence of potassium bicarbonate and 18-crown-6 catalyst permits the ready synthesis (91% to 99% yield) of p-bromophenacyl esters in aqueous acetonitrile. Detection limits are in the 40 to 60 nanogram range. GRA

N83-36151# IBM Research Lab., San Jose, Calif.
NUTATION NMR STUDIES OF POLYACETYLENE
T. C. Clarke, R. D. Kendrick, and C. S. Yannoni 7 Apr. 1983 11 p refs
(Contract N00014-80-C-0779)
(AD-A129487; TR-12) Avail: NTIS HC A02/MF A01 CSCL 07/4

Using nutation NMR spectroscopy we have been able to determine directly the carbon-carbon bond lengths in polyacetylene. For trans-polyacetylene we find double and single bond lengths of 1.36 and 1.44 angstrons, respectively; the double bond in cis-polyacetylene is found to be 1.38 angstrons. Interestingly, at 77 K we do not observe a rapid interchange of the single and double bonds in trans-polyacetylene in the manner predicted for chains containing a soliton defect, suggesting that the majority of the carbons in the trans isomer are on conjugated segments which do not contain such mobile species. Author (GRA)

N83-36152# Seaward, Inc., Falls Church, Va.
DEVELOPMENT OF A FLARING BURNER DISPOSAL SYSTEM Final Report, Oct. 1979 - Jul. 1981
R. L. Beach and W. T. Lewis May 1983 95 p refs
(Grant DOT-CG-930636-A)
(AD-A129402; USCG-D-13-83) Avail: NTIS HC A05/MF A01 CSCL 13/2

This report describes the work performed to develop a flaring burner system for spilled and recovered oils. The system is capable of flaring 180 gpm of light oil or 90 gpm of oil with a viscosity of up to 1,600 centistokes. Smokeless burning can be achieved in certain cases. The system is designed to be portable, such that the entire system can be broken down into modules and transported in a C-130 aircraft, and each module is light enough to be carried to a remote spill site by a Coast Guard helicopter. The system is self-erecting and is capable of operating safely in hazardous environments and in arctic conditions. The report describes the initial burner selection and the tests that were conducted to determine the burning parameters. The performance test program conducted on the completed prototype system is also described. These tests were successfully completed, with the conclusion that the prototype could be used for operational flaring at this time. GRA

N83-36153# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
CHARACTERIZATION AND PHOTOCHEMISTRY OF SURFACE-CONFINED MONONUCLEAR AND TRINUCLEAR PHOSPHINE/CARBONYL COMPLEXES OF RUTHENIUM(0) Interim Technical Report
David K. Liu, Mark S. Wrighton, Dale R. McKay, and Gary E. Maciel 15 Jun. 1983 49 p refs Submitted for publication Sponsored in part by NSF Prepared in cooperation with Colorado State Univ., Fort Collins
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A130666; TR-30-ONR) Avail: NTIS HC A03/MF A01 CSCL 07/5

The characterization and photochemistry of (SiO2)-LRu(CO)4 and (SiO2)-L3Ru3(CO)9 is reported where (SiO2)- represents high surface area (approx. 400 square meters/g) SiO2. Synthesis of the (SiO2)-LRu(CO)4 and (SiO2)-L3Ru3(CO)9 is effected by reaction of Ru(CO)4(PPh2CH2CH2Si(OEt)3) or Ru3(CO)9 (PPh2CH2CH2Si(OEt)3)3 with a hydrocarbon suspension of (SiO2)-. Solid state 13C, (29)Si, and (31)p CP/MAS NMR, FTIR, UV-vis photoacoustic spectroscopy, and elemental analyses establish the nature of the functionalized (SiO2)-. Typical coverage of -LRu(CO)4 or -L3Ru3(CO)9 is approx. 10 to the the minus 10 - ten to the minus 11 mol/square meters. Photoexcitation (near-UV) of (SiO2)-LRu(CO)4 suspended in hydrocarbon media results in chemical reaction consistent with dissociative loss of CO to give a 16-valence electron, surface-confined species that reacts with 2-electron P-donors. The light-induced extrusion of CO can be effected and detected spectroscopically by chemical trapping in rigid media at low temperature (approx. 90 K). Near-UV irradiation of (SiO2)-LRu(CO)4 at 298 K exposed to a gas gives chemistry consistent with dissociative loss of CO, also. Complete (greater than 90%) exchange of CO for (13)CO can be effected by irradiation under 1 atm (13)CO as monitored by FTIR/photoacoustic spectroscopy. The photochemistry of (SiO2)-LeRu3(CO)9 involves metal-metal bond rupture; under 1 atm CO in a solid/gas reaction or as a suspension in hydrocarbon solvent saturated with CO the (SiO2)-L3Ru3(CO)9 yields (SiO2)-(LRu(CO)4)3. GRA

N83-36154# California Univ., Livermore. Lawrence Livermore Lab.
PREDICTION OF LAMINAR FLAME PROPERTIES OF PROPANE-AIR MIXTURES
Charles K. Westbrook and William J. Pitz 22 Feb. 1983 34 p refs Presented at the 9th Intern. Colloq. on Dyn. of Explosions and Reactive Systems, Poitier, France, 3-8 Jul. 1983
(Contract W-7405-eng-48)
(DE83-008293; UCRL-88828; CONF-830704-3) Avail: NTIS HC A03/MF A01

A numerical model including a detailed chemical kinetic reaction mechanism is used to study laminar flame propagation in propane air mixtures. The effects of variations in pressure and fuel oxidizer equivalence ratio are examined. Propane air flames are compared with methane air, methanol air, and ethylene air laminar flames. Quenching of propane air flames in thermal boundary layers is examined, and the results are compared with previous studies of flame wall quenching for methane air and methanol air mixtures, to assess the influence of fuel molecule size on unburned hydrocarbon emissions from internal combustion engines. Finally, the addition of small fractions of propane to natural gas and its influence on laminar burning velocity is studied. DOE

N83-36155# Language Services, Knoxville, Tenn.
GAS PURIFICATION AT HIGH TEMPERATURES
W. Verplancke 1982 10 p ref Transl. into ENGLISH from Chemie-Anlagen und Verfahren, no. 15, 1982 p 31-32 Sponsored by DOE
(DE83-010106; DOE-tr-3010106) Avail: NTIS HC A02/MF A01

Gas purification by filters in the past were subject to a temperature limitation of 250 C. With steel fiber materials this limit can be raised to 500 C. Bekinox steel fibers are produced from different alloys and metals such as stainless steel No. 1.4404, Inconel 601 and Hastelloy X. Bekinox fibers are used for the production of various types of porous media: (1) metal fiber woven fabric (Bekipor-FA); (2) three dimensional nonwoven fibers which are sintered to form a solid porous plate (Bekipor-ST); and (3) needlefelt which is produced when a Bekinox-fiber nonwoven in needle-punched on one or both sides with a Bekipor-FA woven. Industrial pilot tests of filter bags made with these materials show good performance as well as durability. 2 figures, 2 tables. DOE

N83-36156# Colorado State Univ., Fort Collins. Dept. of Chemistry.
CHEMICALLY MODIFIED CARBON, NICKEL, AND PLATINUM ELECTRODES Technical Progress Report, 15 Jan. 1980 - 30 May 1983
C. Michael Elliott 1983 23 p refs
(Contracts DE-AC02-81ER-10968; DE-AC02-80ER-10589)
(DE83-012680; DOE/ER-10968/T1) Avail: NTIS HC A02/MF A01

Topics include: alkyl halide reduction at iron-porphyrin-polymer modified electrodes, polymeric viologen modified electrodes, heterodinuclear complexes of NiC4TPP, bulk Nafion thick film modified electrodes, ring substituted bipyridine complexes of ruthenium and iron, electrochromic polymers from substituted bipyridine complexes of ruthenium, oxidations with high oxidation state metalloprophyrin, and other studies. The chemical modification of carbon, nickel and platinum electrodes was reported. DOE

N83-36157# California Univ., Livermore. Lawrence Livermore Lab.
GAMIDEN: A PROGRAM TO AID IN THE IDENTIFICATION OF UNKNOWN MATERIALS BY GAMMA-RAY SPECTROSCOPY
R. J. Howerton 10 May 1983 14 p refs
(Contract W-7405-eng-48)
(DE83-013020; UCRL-50400-Vol-22-Rev-2) Avail: NTIS HC A02/MF A01

The intent of the computer code GAMIDEN is to help identify isotopes by their gamma ray emissions and thus to assist in the nondestructive assay of unknown materials. From both radioactive decays and neutron captures, GAMIDEN searches GAMTOT83, a file of gamma ray spectra, for matches with observed photon energies. The search procedure is described, the use of the code is outlined. The code is designed to operate on the CRAY 1 computer. It is written in standard FORTRAN (ANSI) for the most part but contains some LRLTRAN instructions to make use of the time-sharing system. The code uses about 545,000 words of memory. Typical problems run in about 45 s. The source program and the data file are available on request. DOE

N83-36158# California Univ., Livermore. Lawrence Livermore Lab.

CHEMICAL KINETICS OF PROPANE OXIDATION IN GASEOUS DETONATIONS

Charles K. Westbrook, William J. Pitz, and Paul A. Urtiew 9 Feb. 1983 32 p refs Presented at the 9th Intern. Colloq. on Dyn. of Explosions and Reactive Systems, Poitier, France, 3-8 Jul. 1983
(Contract W-7405-eng-48)
(DE83-007346; UCRL-88707; CONF-830704-1) Avail: NTIS HC A03/MF A01

A theoretical model including a detailed chemical kinetic reaction mechanism for hydrocarbon oxidation is used to examine detonation properties for mixtures of propane/air, propane/oxygen, and propane/oxygen diluted with varying amounts of nitrogen. Computed induction lengths are compared with available experimental data for critical energy and critical tube diameter for initiation of unconfined spherical detonation, as well as detonation limits in linear tubes. DOE

N83-36159# California Univ., Berkeley. Lawrence Berkeley Lab.
STRUCTURAL AND PHOTOELECTROCHEMICAL PROPERTIES OF PLASMA-DEPOSITED TITANIUM DIOXIDE Ph.D. Thesis

Larry McClease Williams Sep. 1982 212 p refs
(Contract DE-AC03-76SF-00098)
(DE83-002574; LBL-14994) Avail: NTIS HC A10/MF A01

A glow discharge was used to enhance the reaction rate between TiCl4 and oxygen to deposit thin TiO2 films. Film structural, optical, electronic, and photoelectrochemical properties were examined as functions of deposition parameters. Films deposited onto glass substrates were amorphous below 300 C, anatase at 300 and 400 C, mixed anatase - rutile at 500 C, and only rutile at equal to or > 600 C. Films deposited on other substrates showed similar behavior. Largest crystallites were obtained using low RF powers (5 to 10 watts) and sapphire substrates. ESCA and AES showed chlorine present in films deposited at equal to or < 200 C. Chlorine was undetectable in films deposited at equal to or > 400 C. Presence of chlorine in the films affected the electronic properties by acting as an electron acceptor. Dielectric constants for the films ranged from 25 to 166. Plasma deposited TiO2 photoanodes were fabricated with quantum efficiencies of 60 to 80% for the photoelectrolysis of water. Author

N83-36160# Lewin and Associates, Inc., Washington, D. C.
CONCEPTUAL MODELS FOR GAS HYDRATES. PHASE 1: TECHNICAL DIRECTIVE 6 Final Report

V. Kuuskraa, V. Hammershaimb, and W. Sawyer 10 Jun. 1983 59 p
(Contract DE-AC21-82MC-19239)
(DE83-015129; DOE/MC-19239/1422) Avail: NTIS HC A04/MF A01

Three conceptual models for the recovery of methane hydrates are discussed that address different recovery of methods for producing gas from hydrates. The three models are: (1) single well cyclic thermal injection; (2) multiwell continuous thermal injection; and (3) reservoir depressurization. In the first model, a reservoir is stimulated (either radially, horizontally or vertically), steam is injected, and water/gas are produced cyclically. In the second model, 2 or more wells are interconnected by an induced fracture and the injection of steam and production of gas and water are continuous. In the third model, an induced fracture with a large surface area is propagated into the reservoir, the pressure in the fracture is maintained at a low value, and gas is produced through the gas-ice zone as the hydrate dissociates. The three conceptual hydrate recovery models represent original work as well as building on prior work by others. Five previously published models are reviewed for their strong and weak points and applicability to this modeling effort is summarized. DOE

N83-36161# State Univ. of New York, Buffalo. Combustion Lab.
CATALYTIC COMBUSTION OF SYNTHETIC FUELS Final Technical Report

Lawrence A. Kennedy 28 Mar. 1983 243 p
(Contract DE-FG22-80PC-30220)
(DE83-011116; DOE/PC-30220/T3; Rept-83-14) Avail: NTIS HC A11/MF A01

Experimental and numerical results are reported concerning the lean fuel oxidation of propane in a transition metal oxide based catalytic combustor. The catalyst used was comprised of binary transition metal oxides (Co3O4, Cr2O3) deposited either on alumina pellets or alumina washcoated ceramic, honeycomb monoliths. The effect of inlet temperature, inlet velocity and inlet equivalence ratio on combustor operation was studied under lean fuel conditions. The sensitivity of the combustor efficiency to small perturbations in inlet conditions was computed from experimental data. The existence of multiple steady states in the combustor, and the range of inlet conditions under which they occur was investigated. Transitions between the different steady states were also studied. The heterogeneous kinetics for lean fuel oxidation of propane on this catalyst were represented using a three step, global mechanism. The rate parameters were computed from experimental data. DOE

N83-36162# California Univ., Berkeley. Lawrence Berkeley Lab.
LOW-ENERGY ELECTRON DIFFRACTION (LEED) AND HIGH-RESOLUTION ELECTRON-LOSS SPECTROSCOPY (HREELS) STUDIES OF MOLECULAR ADSORBATES ON MODEL CATALYST SURFACES

B. E. Koel, M. A. VanHove, and G. A. Somorjai Dec. 1982 82 p refs Presented at the Symp. on Advances in Catalytic Chem. 2, Salt Lake City, 16 Jun. 1982 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE83-012890; LBL-14504; CONF-8206202-1) Avail: NTIS HC A05/MF A01

The structures of adsorbed CO, several olefins, and several other small molecules that were recently studied by both LEED and HREELS studies were discussed. When adsorbed on metal-crystal surfaces, several binding states of CO were observed that fill as a function of coverage. Acetylene, ethyelen, propylene, methylacetylene, and butenes all undergo structural transitions as a function of temperature and are accompanied by drastic changes in bonding. On Pt and Rh single crystal surfaces, the most stable molecular arrangement for these adsorbed hydrocarbons near room temperature appears to be the alkylidyne structure with the C-C bond axis perpendicular to the metal surface and the molecule anchored to a 3-fold surface site on a (111) plane. Increased temperatures lead to sequential bond breaking and fragmentation. The Ch and C2H fragments appear to be the active species present on transition metal surfaces during catalytic reactions. The vibrational spectra obtained on single crystal and dispersed rhodium particle surface are also compared. DOE

N83-36163# Wayne State Univ., Detroit, Mich.
PHOTOCHEMICAL ACTIVATION AND REACTIVITY OF POLYNUCLEAR TRANSITION METAL COMPLEX MOLECULES Final Report

J. F. Endicott and R. L. Lintvedt Jun. 1982 6 p refs
(Contract DE-AC02-78ER-04685)
(DE83-013863; DOE/ER-04685/2) Avail: NTIS HC A02/MF A01

Several bi- and trinuclear metal complexes containing ligands from (ALPHA)-polyketonates were synthesized and characterized including homo- and hetero-polynuclear complexes. New synthetic approaches to the preparation of heterobi- and trinuclear complexes were developed that allow the preparation of a large number of molecules containing heavy metal ions such as Pd(2) or UO2(2) and a first row transition metal ion. The electrochemical properties of these complexes were investigated and many exhibit the ability to transfer two electrons at very nearly the same potential. Photochemical studies on binuclear Cu(II) and Ni(II) showed that these compounds yielded reduced metal species and decomposition upon irradiation. Luminescence of hetero-complexes of uranyl polyletonates is observed at 770 K with the UO2(2) moiety functioning as an isolated chromophore in which emission is observed only on direct excitation of UO2(2) and energy transfer to lower states in the molecule is not observed. DOE

N83-36164# Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry.

CHEMICAL PROPERTIES OF OH RADICAL AND ITS ROLE IN BIOLOGICAL PROCESSES Progress Report, Jul. 1982 - Jun. 1983

G. Czapski 1983 9 p refs
(Contract DE-AC02-76EV-03221)
(DE83-013387; DOE/EV-03221/76) Avail: NTIS HC A02/MF A01

Production of OH radicals may be by radiolysis, photolysis, or the Fenton reaction: Fe9(2) + H2O2 (FEMALE) Fe(3) + OH (+) + OH. Physical properties of hydroxyl radicals in aqueous media are discussed. Chemical properties of the radicals are also considered. Reaction of the radicals and their importance in biology are also discussed. DOE

N83-36165# Oak Ridge Gaseous Diffusion Plant, Tenn. Analytical Chemistry Div.

ELECTROPLATING SYSTEM FOR RADIOCHEMICAL ANALYSIS

H. C. Jones, C. Sulfridge, and T. A. Brown Jun. 1983 9 p
(Contract W-7405-eng-26)
(DE83-014173; K/PS-496) Avail: NTIS HC A02/MF A01

An electroplating system was designed and fabricated for radiochemical analysis. The system consists of four plating units using commercially available power supplies and stirring motors. Reliability and ease of maintenance were primary objectives in this design. Satisfactory reliability was obtained by careful selection of components and the use of liberal safety factors in circuit design. Ease of maintenance was effected by modular arrangement of the four units. DOE

N83-36166# Oak Ridge National Lab., Tenn. Chemical Technology Div.

HIGH-CAPACITY PRESSURIZED CONTINUOUS CHROMATOGRAPH

John M. Begovich, Charles H. Byers, and Warren G. Sisson 1983 34 p refs Presented at the 3rd Symp. on Separation Sci. and Technol. for Energy Applications, Gatlinburg, Tenn, 28 Jun. - 1 Jul. 1983
(Contract W-7405-eng-26)
(DE83-014004; CONF-830633-3) Avail: NTIS HC A03/MF A01

Multicomponent liquid chromatographic separations were achieved by using a slowly rotating annular bed of sorbent material. The feed material is continuously introduced at a stationary point at the top of the bed, and eluent is allowed to flow everywhere else around the annulus. The rotation of the sorbent bed causes the separated components to appear as helical bands, each of which has a characteristic, stationary exit point; hence the separation process is truly continuous. The concept was developed primarily on a 279-mm-diam by 0.6-m-long device with a 12.7-mm-wide annulus. The effects of annulus width and diameter were studied using the same device with annulus widths up to 114.3 mm. With this largest width, approximately 96% of the area available within the outer cylinder is devoted to the rotating sorbent bed. Further annulus-width studies were pursued on units with 89- and 445-mm diameters. These geometric extensions to the basic concept allow extremely large capacity increases with minimal loss in separation and no increase in chromatograph diameter. DOE

N83-36167# Sandia Labs., Albuquerque, N. Mex.

IONIZATION-DETECTED RAMAN SPECTROSCOPY

P. Esherick and A. Owyoung 1983 3 p refs Presented at the 6th Intern. Conf. on Laser Spectroscopy, Interlaken, Switzerland, 27 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013774; SAND-83-1439C; CONF-830666-1) Avail: NTIS HC A02/MF A01

Stimulated Raman spectroscopy (SRS) was proven to be a viable tool for ultrahigh resolution gas phase spectroscopy. A new approach to stimulated Raman spectroscopy that significantly increases sensitivity while maintaining the high spectral resolving power of SRS is reported. The enhanced sensitivity of this new technique is obtained by combining highly sensitive resonant laser ionization methods with stimulated Raman excitation. DOE

N83-36168# Sandia Labs., Albuquerque, N. Mex.

NON-VACUUM RUTHERFORD BACKSCATTERING SPECTROMETRY

B. L. Doyle 1983 14 p refs Presented at the 6th Intern. Conf. on Ion Beam Analysis, Tempe, Ariz., 22 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-013977; SAND-83-0193C; CONF-830570-6) Avail: NTIS HC A02/MF A01

External beams of high energy protons (3 to 6 MeV) and alpha particles (10 MeV) for the first time were used successfully for Rutherford Backscattering Spectrometry depth profiling. This new capability permits the analysis of objects which are too large or otherwise incompatible with an accelerator vacuum system. Preliminary tests of this system indicate the potential for a depth resolution of better than 1 (SIGMA)m IR Si and an analysis range of more than 30 (SIGMA)m for external 4.5 MeV protons. The merits and limitations of the system are discussed together with applications presently underway. DOE

N83-36169# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemistry.

THERMOPHYSICAL PROPERTIES OF INORGANIC POLYSULFIDES Final Report

George J. Janz May 1983 12 p refs Sponsored by Department of Energy
(DE83-011762; DOE/ER-10387/T1) Avail: NTIS HC A02/MF A01

The techniques of DSC calcrimetry were used to investigate the properties of sodium and potassium polysulfides-sulfur in the composition range relevant to advanced battery concepts. Advances in calcrimetric techniques, preparative and analytical methods, and thermal measurements for a limited series of polysulfides, spanning the composition range from the disulfides up to the penta= and hexa-polysulfides and elemental sulfur were included. A number of unique and unusual properties for the polysulfides were characterized through these measurements, particularly a loss of memory of crystallinity, and an inverse-crystallization behavior. Additionally the thermicities of the events (when mixtures of sulfur and polysulfides are heated) were investigated. Pronounced exothermic events occur at temperatures well below the melting temperatures. The thermal events observed to occur in the sulfur-sodium polysulfide system were measured quantitatively using a preparative approach in which the reactions are monitored. DOE

N83-36170# Oak Ridge National Lab., Tenn. Chemical Physics Sect.

SENSITIVE MEASUREMENT OF KRYPTON USING RESONANCE IONIZATION SPECTROSCOPY

C. H. Chen and G. S. Hurst 1983 6 p Presented at the DOE Contractors Workshop on Advanced Laser Technol. for Chem. Measurements, Livermore, Calif., 8-9 Jun. 1983
(Contract W-7405-eng-26)
(DE83-013757; CONF-830657-1) Avail: NTIS HC A02/MF A01

In order to count noble gas atoms with isotope selectivity, a laser-mass spectrometer was developed. DOE

N83-36171# Institute of Gas Technology, Chicago, Ill. Photochemistry Basic Research Div.

SOLAR-ASSISTED HYDROGEN GENERATION BY PHOTOELECTROCATALYSIS Final Report, Mar. 1981 - May 1982

Peter G. P. Ang, Paul F. Richardson, Phek Hwee Yen, Anthony J. Tiller, and Anthony F. Sammells May 1983 84 p refs Sponsored in part by the Gas Research Inst.
(IGT Proj. 30532)
(PB83-211904; GRI-81/0130) Avail: NTIS HC A05/MF A01 CSCL 07D

The goal was to gain a basic understanding of how surface modifications of illuminated semiconductors can enhance the efficiency of photoelectrolytic hydrogen generation. Semiconductor electrodes have been used to carry out photoassisted electrolysis processes for the production of hydrogen from water. Better photoelectrodes will increase the efficiency of these processes.

This was accomplished through modification of the semiconductor surface by deposition of electrocatalysts or by photosensitization. Electrolyte modifications can also result in enhanced photoelectrochemical performance from the semiconductor/liquid junction.
GRA

N83-36172# Notre Dame Univ., Ind. Lab. for Radiation.
BIWEEKLY LIST OF PAPERS ON RADIATION CHEMISTRY AND PHOTOCHEMISTRY. ANNUAL CUMULATION WITH KEYWORD AND AUTHOR INDEXES, VOLUME 15, 1982
A. B. Ross 1982 434 p Sponsored in part by NBS and DOE
(PB83-203638) Avail: NTIS HC A19/MF A01 CSCL 07D

This document is the annual edited cumulative list of references to the published literature on radiation chemistry, photochemistry, and related fields. References are drawn from 60 journals published throughout the world. The list is generated from the Biweekly List of Papers on Radiation Chemistry, and Photochemistry and contains the literature references and an author and subject index. The publication represents one of the continuing data activities of the Radiation Chemistry Data Center (RCDC) at the University of Notre Dame. Volume 15 also contains a 54 page 'Thesaurus for Radiation Chemistry' which lists indexing terms which make up the group of keywords used in the RCDC computer readable bibliographic data base.
Author (GRA)

N83-36173# National Bureau of Standards, Washington, D.C. Center for Analytical Chemistry.
STANDARD REFERENCE MATERIALS: ACCURACY IN ANALYTICAL SPECTROPHOTOMETRY Final Report
R. W. Burke and R. Mavrodineanu Apr. 1983 141 p refs
(PB83-214536; NBS-SP-260-81; LC-83-600512) Avail: NTIS HC A07/MF A01 CSCL 14B

The activities undertaken since 1969 within the Center for Analytical Chemistry at the National Bureau of Standards (NBS) in the field of high-accuracy spectrophotometry are described. A summary of the Standard Reference Materials (SRM's) that were developed for checking the proper functioning of ultraviolet and visible spectrophotometers are presented and a description of the high-accuracy spectrophotometer specially constructed in the Center for Analytical Chemistry and subsequently used for performing all of the transmittance measurements was included. A critical discussion of the analytical factors that can affect the accuracy of selected spectrophotometric procedures that were widely used at NBS in the characterization of various SMR's are discussed.
GRA

N83-36174# Bechtel Corp., San Francisco, Calif.
PARAMETRIC STUDY OF SEAWATER REVERSE OSMOSIS DESALTING PLANTS
Randall Soo-Hoo, Sherman May, and Leon Awerbuch Jan. 1983 193 p refs
(Contract DI-14-34-0001-1486)
(PB83-220608; OWRT-C-10141-D(1486)(1)) Avail: NTIS HC A09/MF A01 CSCL 07A

A comprehensive parametric technical and economic study on seawater reverse osmosis desalination plants was conducted to derive updated costs for seawater reverse osmosis plants ranging in capacity from 1,000,000 gpd to 5 million gpd at a Caribbean site and at a Continental U.S. site. Hollowfiver and spiral-wound membranes in one and twopass configurations, various seawater intakes (surface, water well, Ranney collector), various high pressure pumping systems (centrifugal, positive dispacement), optional energy recovery systems (Pelton wheel, reverse-running pumps, flow work exchanger), and operation and maintenance labor requirements were considered. Process flow diagrams, piping and instrumentation diagrams, material lists, and plant layout diagrams were developed.
GRA

N83-36175# Environmental Research Lab., Athens, Ga.
A COMPUTER SURVEY OF GC/MS (GAS CHROMATOGRAPHY/MASS SPECTROMETRY) DATA ACQUIRED IN EPA'S (ENVIRONMENTAL PROTECTION AGENCY) PRIORITY POLLUTANT SCREENING ANALYSIS: SYSTEM AND RESULTS
W. M. Shackelford, D. M. Cline, F. O. Burchfield, L. Faas, G. Kurth, and A. D. Sauter Jun. 1983 186 p refs Prepared in cooperation with Computer Science Corp., Falls Church, Va.
(PB83-220111; EPA-600/4-83-029) Avail: NTIS HC A09/MF A01 CSCL 07D

The screening analysis phase of the best available treatment (BAT) review of wastewater treatment techniques by EPA was initiated to assess 21 industrial categories for the 129 'priority pollutants.' Implicit in the purpose of the screening analysis for these pollutants was the notion that the raw GC/MS data would be saved for later evaluation for compounds not on the priority pollutant list. To this end, a system of computer programs was built that automatically extracts the pure spectra of components in a GC/MS run, matches these spectra against a reference library, and deals appropriately with matched and unmatched spectra.
GRA

N83-36176# Council for Mineral Technology, Randburg (South Africa). Analytical Chemistry Div.
THE DETERMINATION, BY X-RAY-FLUORESCENCE SPECTROMETRY, OF TIN AND TUNGSTEN IN ORES, CONCENTRATES AND RESIDUES OF SCHEELITE, WOLFRAMITE AND CASSITERITE
Andre Marie Eloi Balaes, Jurgens Johannes Jacobs, Anthony Richard Bray, and Keith Kendrick 21 Mar. 1983 30 p refs
(PB83-220152; MINTEK-M69; ISBN-0-86999-602-9) Avail: NTIS HC A03/MF A01 CSCL 07D

The determination of tin and tungsten in ores and concentrates consisting of mixtures of scheelite and cassiterite or of wolframite and cassiterite, is very important to the production of these minerals in Southern Africa. Several methods using X-ray-fluorescence spectrometry (XRFS) was developed for the determination of tin and tungsten.
DOE

N83-36177# Rensselaer Polytechnic Inst., Troy, N. Y.
PREDICTING PREFERENTIAL ADSORPTION OF ORGANICS BY ACTIVATED CARBON
Georges Belfort, Gordon L. Altshuler, Kusuma K. Thallam, Charles P. Feerick, Jr., and Karen L. Woodfield Jun. 1983 102 p refs (Grant EPA-R-806648)
(PB83-222778; EPA-600/2-83-047) Avail: NTIS HC A06/MF A01 CSCL 07D

Preferential adsorption of organic compounds onto activated carbon from dilute acqueous solutions was studied to develop a comprehensive theoretical basis for predicting adsorption of multicomponent solutes. The research program investigates why some solutes are strong adsorbers, and others weak, and why some solutes displace others during aqueous phase adsorption. The overall objectives were to develop, test, and simplify the theoretical basis for prediction.
GRA

N83-36178# National Standard Reference Data System.
SELECTED TABLES OF ATOMIC SPECTRA. A: ATOMIC ENERGY LEVELS. B: MULTIPLE TABLE O 4. DATA DERIVED FROM THE ANALYSES OF OPTICAL SPECTRA
Charlotte E. Moore 1983 23 p refs Revised Sponsored in part by Naval Research Lab.
(PB83-208942; NSRDS-NBS-3-Sect-10-Rev; LC-64-60074) Avail: NTIS HC A02/MF A01 CSCL 07D

A revision of two sets of tables containing data on atomic spectra as derived from analyses of optical spectra is provided. As in the previous Sections, Part A contains the atomic energy levels and Part B the multiplet tables.
GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N83-36179*# Martin Marietta Corp., Denver, Colo.
NDE DETECTABILITY OF FATIGUE TYPE CRACKS IN HIGH STRENGTH ALLOYS Final Report, 8 Oct. 1981 - 31 Jul. 1983

Brent K. Christner and Ward D. Rummel Jul. 1983 96 p refs (Contract NAS8-34425)
(NASA-CR-170879; NAS 1.26:170879; MCR-83-568) Avail: NTIS HC A05/MF A01 CSCL 11F

Specimens suitable for investigating the reliability of production nondestructive evaluation (NDE) to detect tightly closed fatigue cracks in high strength alloys representative of those materials used in spacecraft engine/booster construction were produced. Inconel 718 was selected as representative of nickel base alloys and Haynes 188 was selected as representative of cobalt base alloys used in this application. Cleaning procedures were developed to insure the reusability of the test specimens and a flaw detection reliability assessment of the fluorescent penetrant inspection method was performed using the test specimens produced to characterize their use for future reliability assessments and to provide additional NDE flaw detection reliability data for high strength alloys. The statistical analysis of the fluorescent penetrant inspection data was performed to determine the detection reliabilities for each inspection at a 90% probability/95% confidence level. Author

N83-36180# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
THE EFFECT OF HYDROGEN ON THE MULTIAXIAL STRESS-STRAIN BEHAVIOR OF TITANIUM TUBING
C. W. Lentz, D. A. Koss, M. G. Stout, and S. S. Hecker Mar. 1983 27 p refs Prepared in cooperation with LASL, N. Mex. Sponsored in part by DOE
(Contract N00014-76-C-0037; NR Proj. 031-756)
(AD-A128996; TR-20) Avail: NTIS HC A03/MF A01 CSCL 11/6

The influence of internal hydrogen on the multiaxial stress-strain behavior of commercially pure titanium has been studied. Thin-walled tubing specimens containing either 20 or 1070 ppm hydrogen have been tested at constant stress ratios in combined tension and internal pressure. The addition of hydrogen lowers the yield strength for all loading paths but has no significant effect on the strain hardening behavior at strains epsilon >or= 0.02. Thus, the hydrogen embrittlement of titanium under plain strain or equibiaxial loading is not a consequence of changes of flow behavior. The yielding behavior of this anisotropic material is described well by Hill's quadratic yield criterion. As measured mechanically and by pole figure analysis, the plastic anisotropy changes with deformation in a manner which depends on stress state. Hill's criterion and the associated flow rule do not describe the multiaxial flow behavior well because of their inability to account for changes of texture which depend on multiaxial stress path. Hence, a strain dependent, texture-induced strengthening effect in equibiaxial tension is observed, this effect having the form of an enhanced strain hardening rate. Author (GRA)

N83-36181# Purdue Univ., Lafayette, Ind. Thermophysical and Electronic Properties Information Analysis Center.
ELECTRICAL RESISTIVITY OF ALUMINUM AND MANGANESE, STATE-OF-THE-ART REPORT
P. D. Desai, H. M. James, and C. Y. Ho Mar. 1983 93 p refs (AD-A129158; CINDAS-65) Avail: NTIS HC A05/MF A01 CSCL 11/6

This work compiles, reviews, and discusses the available data and information on the electrical resistivity of aluminum and manganese and presents the recommended values resulting from critical evaluation, correlation, analysis, and synthesis of the available data and information. The recommended values presented are uncorrected and also corrected for the thermal expansion of the materials and cover the temperature range from 1 K to above the melting point into the molten state for aluminum and to 700 K for manganese. The estimated uncertainties in most of the values are about plus or minus 2% to plus or minus 5%. Author (GRA)

N83-36182# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
SINTERABILITY OF ZrO2 AND Al2O3 POWDERS: THE ROLE OF PORE COORDINATION NUMBER DISTRIBUTION Final Report, 1 Apr. 1982 - 31 Mar. 1983
F. F. Lange and B. I. Davis May 1983 29 p refs
(Contract N00014-82-C-0341)
(AD-A129149; SC5325.2FR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The sinterability of two ZrO2 powders containing 2.2 and 6.6 m/o Y2O3, respectively, a Al2O3 powder, and Al2O3/10 v/o ZrO2 composite powder was investigated. Shrinkage was measured at a constant heating rate. Capillary size distributions were determined by mercury intrusion after heating compacts to various temperatures. Iso-pressing eliminated larger pores with larger coordination numbers which results in greater sinterability. Local densification, i.e., densification of multiple-particle packing units, enlarged pores between these packing units. This phenomenon of local densification initiated prior to bulk shrinkage and stopped when the shrinkage rate reached its maximum. ZrO2 inclusions, known to inhibit grain growth, also inhibited sinterability. This observation, coupled with previous work, strongly suggests that grain growth, supported by dense packing units, helps lower the coordination number of pores and therefore is helpful in the sintering process. Large multiple-particle packing units (large agglomerates) produce unsinterable pores, i.e., pores with high coordination numbers. It was shown that colloidal/sedimentation treatments which decrease the size of the soft and hard agglomerates reduced sintering temperatures and increased strength. Author (GRA)

N83-36183# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
MECHANISMS OF CORROSION FATIGUE IN HIGH STRENGTH I/M (INGOT METALLURGY) AND P/M (POWDER METALLURGY) ALUMINUM ALLOYS
R. P. Wei and P. S. Pao (McDonnell Douglas Research Labs.) Feb. 1983 70 p refs
(Contract F49620-81-K-0004; AF Proj. 2306)
(AD-A130041; IFSM-83-114; TR-2; AFOSR-83-0560TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

High strength aluminum alloys are employed extensively in the primary structure of current and projected Air Force and civilian aircraft. The service lives and reliability of these aircrafts depend to a great extent on the corrosion fatigue resistance of the structure alloys. Significant efforts are underway to develop powder metallurgy (P/M) alloys that would provide improved corrosion fatigue resistance along with improvements in other mechanical properties. The objective of this study is to understand the chemical and metallurgical aspects of environmental assisted fatigue crack growth (or corrosion fatigue) that can serve (1) as a basis for guiding the development of new and improved alloys, and (2) as a basis for developing rational design procedures for service life predictions. A coordinated fracture mechanics, surface chemistry and materials science approach is used. The research is being performed by Lehigh University with technical support by McDonnell Douglas Research Laboratories. Author (GRA)

N83-36184# Dayton Univ., Ohio. Research Inst.
SPECTRUM FATIGUE CRACK GROWTH RATE CHARACTERISTICS OF PM (POWDER METALLURGY) ALUMINUMS 7090 AND 7091 Interim Technical Report, Jul. 1982 - Jan. 1983
John J. Ruschau Wright-Patterson AFB, Ohio AFWAL Apr. 1983 38 p refs
(Contract F33615-82-C-5039; AF Proj. 7421)
(AD-A129846; AFWAL-TR-83-4032; UDR-TR-83-12) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fatigue crack growth rate testing was performed on powder-metallurgy (PM) produced aluminum 7090 and 7091. Forms examined for each alloy were plate, extrusions, and hand forgings. Crack growth properties for each material were evaluated using both a fighter aircraft-type spectrum (FALSTAFF) and a transport-type aircraft spectrum (Mini-TWIST). All results are compared to ingot-metallurgy (IM) produced aluminum 7050-T76 plate. Results under spectrum loading conditions indicate the PM 7091 alloys are consistently superior to aluminum 7050 in terms of spectrum

fatigue crack growth resistance, while the 7090 alloys were clearly inferior. The best PM alloy in terms of crack growth resistance was 7091-T7E69 extrusion; the worst was the 7090-T7E80 forging. Though an improvement in crack growth resistance was observed for the 7091 materials over 7050 under complex loading, constant amplitude crack growth rates for both 7090 and 7091 are considerably greater than that for 7050. These apparent conflicting results are believed to be a result of beneficial load interactions (crack retardation) for the 7091 materials occurring during complex loading. Author (GRA)

N83-36185# Naval Research Lab., Washington, D. C. Mechanics of Materials Branch.

EFFECT OF MICROSTRUCTURE, STRENGTH AND OXYGEN CONTENT ON FATIGUE CRACK GROWTH RATE OF Ti-4.5Al-5.0Mo-1.5Cr (CORONA 5) Final Report

G. R. Yoder, F. H. Froes (AFWAL), and D. Eylon (Metcut Materials Research Group) 17 Jun. 1983 40 p refs

(Contracts F33615-79-C-5152; F33615-82-C-5078; RR0220148)

(AD-A129811; NRL-MR-5091) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fatigue crack growth rate behavior in CORONA 5, an alloy developed for applications requiring high fracture toughness, has been examined for eight material conditions. These conditions were designed to give differences in microstructure, strength level, and oxygen content, in such a manner that the separate effects of these variables could be defined. For all eight conditions, fatigue crack growth rates (da/dN) are virtually indistinquishable over the full all spectrum of stress-intensity range (Delta K) examined. Concomitantly, it is noted that over the sizeable solution annealing range studied, the primary alpha-phase morphology was substantially invariant. A change in microfractographic appearance occurs at delta KT, as extensive secondary cracking along Alpha/Beta interfaces is observed at all hypertransitional levels of Delta K, but not for Delta K < Delta KT. For each material condition, the mean length of primary Alpha platelets is approximately the same as the cyclic plasic zone size at Delta KT. Accordingly, locations of Delta KT (and their similarity for the different material conditions) are rationalized in conformance with a cyclic plastic zone model of fatigue crack growth. Finally, the difference in behavior of CORONA 5, as compared to conventional Alpha/Beta alloys such as Ti-6Al-4V, is rationalized in terms of crack path behavior. GRA

N83-36186# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Research Div.

MECHANICAL PROPERTIES AND FRACTOGRAPHY OF ELECTROSLAG REMELTED 300M STEEL Final Report

Albert A. Anctil Mar. 1983 37 p refs

(DA Proj. 1L1-62105-AH-84)

(AD-A129748; AMMRC-TR-83-13) Avail: NTIS HC A03/MF A01 CSCL 11/6

Engineering and stress corrosion cracking properties, with microscopic examination of fracture surfaces, are presented for a high strength electroslag remelted 300M steel. Comparisons are made of electroslag remelted 4340 steel and electroslag and vacuum arc remelted 300M and 4340 steels. Electroslag remelted 300M steel at high strength levels can achieve the mechanical property levels obtained by vacuum arc remelting in the longitudinal orientation. However, the short transverse ductility of electroslag remelted 300M steel varies considerably and can be unacceptably low. Scanning electron microscopic examination of short transverse tensile specimens having good ductility did not reveal any fractographic differences that could be related to the heat treatment process. Impact energy varied with orientation. No improvement in stress corrosion cracking susceptibility was obtained over VAR 4340 steel. Author (GRA)

N83-36187# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Research Div.

LAVES PHASE FORMATION AND HARDENING OF MARTENSITIC Fe-9Ni-9Co-Ti ALLOYS Final Report

Weily F. Chiao May 1983 34 p refs

(DA Proj. 1T0-61109-1A)

(AD-A129782; AMMRC-TR-83-19) Avail: NTIS HC A03/MF A01 CSCL 11/6

A new alloy series, Fe-9%Ni-9%Co with 0 to 5% Ti, has been designed to investigate the formation and hardening of Laves phases in Fe-base alloys. The general microstructural features and hardness properties were investigated after different heat treatments. In addition, the age hardening process was studied. Laves precipitates were formed in the forged, normalized, and annealed conditions. The age hardening was due to the precipitation of Laves phases from the solution-treated matrix. Maximum hardening was developed by aging the solution-treated 5%-Ti alloy at 500 C for 10 hr. No hardening response was observed in the Ti-free alloy. Both optical and scanning electron microscopy were used to follow the aging process and the morphological changes of the precipitate phases. Analysis of precipitation kinetics and morphology indicates that the nucleation of Laves phases is controlled by the martensitic substructure, particularly the martensitic lath boundaries. The level of hardening obtained is significantly greater than that reported for similar ferritic and austenitic steels. GRA

N83-36188# SRI International Corp., Menlo Park, Calif.

DIP PROCESS THERMAL-BARRIER COATINGS FOR SUPERALLOYS Final Technical Report, 15 Dec. 1980 - 14 Jan. 1983

Ibrahim M. Allan and David Rowcliffe Mar. 1983 36 p refs

(Contract F49620-81-K-0009; AF Proj. 2306)

(AD-A129292; SRI-2509; AFOSR-83-0441TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

A new concept of growing a ceramic-based thermal barrier coating on gas turbine alloys was investigated. This process involves hot dipping alloy substrates in low-melting cerium-nickel or zirconium-nickel eutectics. Cerium oxide (CeO2) or zirconium oxide (ZrO2) were then grown by selective oxidation to form an external thermal barrier layer above an inner composite (CeO2 or ZrO2/substrate alloy) layer. The microstructure and chemical composition of the thermal barriers were studied as a function of composition of melts and substrates, dipping temperature and oxidation conditions. This evaluation has led to a good understanding of the factors that control the formation of desirable coatings and to the specification of the conditions to produce them. An important advantage of ZrO2-based coatings over CeO2-based coatings produced by this technique is that ZrO2 grows totally as an overlay layer with little or no influence of elements from the substrate. In contrast, CeO2-based coatings grow completely within the surface zone of the coated substrate, and thus their properties can be affected by substrate constituents. The results of this program suggest that the dip process could be an important alternative approach to plasma spraying for producing thermal barrier coatings on superalloys. GRA

N83-36189# Martin Marietta Labs., Baltimore, Md.

THE DELAYED FRACTURE OF ALUMINUM ALLOYS Final Draft Report, 15 Mar. 1982 - 15 Mar. 1983

Joseph R. Pickens, Timothy J. Langan, Guy D. Davis, Leontios Christodoulou, and Leslie Struble May 1983 67 p refs

(Contract N00014-82-C-0378)

(AD-A129551; MML-TR-83-11C) Avail: NTIS HC A04/MF A01 CSCL 06/11

Research was performed in two areas: The role of grain boundary (GB) segregation in the stress-corrosion cracking (SCC) of Al-Zn-Mg alloys, and mechanism of SCC in Al-Li binary alloys. In the segregation area, a technique of measuring GB segregation was developed that uses liquid gallium to expose the GB's for examination by static and scanning Auger electron spectroscopy. GB segregation of Mg atoms, not bound in MgZn precipitates, was found. Furthermore, the extent of this segregation generally decreases with aging time, consistent with the decrease in SCC susceptibility found in other work. These results will be discussed with respect to various proposed mechanisms of SCC in this alloy system. In the Al-Li area, a study of the SCC of binary aluminum lithium alloys in a saline solution shows that alloys having Li content greater than the room temperature solid solubility limit can be susceptible to SCC. Furthermore, the degree of susceptibility

depends on the aging condition, the peak-aged temper being the most susceptible. Fracture is intergranular and crack propagation is discontinuous. Possible mechanisms for the observed behavior are also discussed. Author (GRA)

N83-36190# Colorado School of Mines, Golden. Center for Welding Research.
THE INVESTIGATION OF THE INFLUENCE OF WELDING FLUX ON THE PYROMETALLURGICAL PHYSICAL AND MECHANICAL BEHAVIOR OF WELD METAL Final Report
David L. Olson 17 May 1983 42 p refs
(Grants DAAG29-76-G-0143; DAAG29-77-G-0097; DAAG29-78-G-0052; DAAG29-79-G-0066)
(AD-A129569; ARO-13500.4-MS; ARO-16348.14-MS; CSMCWR-8301) Avail: NTIS HC A03/MF A01 CSCL 13/8

The behavior of the physical, chemical and mechanical processes associated with submerged arc welding fluxes was characterized and mechanistically modeled. Of particular interest was the utilization of manganese and calcium silicate welding fluxes to achieve high performance submerged arc steel weldments. The determination of the specific role of the ionic additions on the behavior of these welding flux systems has been achieved. This investigation established a more fundamental understanding of welding flux behavior from which it is anticipated that a more sophisticated methodology will result for the future development of submerged arc welding consumables for advanced engineering steels. Author (GRA)

N83-36191# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
FRACTURE TOUGHNESS DEGRADATION IN HY-80 AND HY-100 AFTER PRESTRAINING M.S. Thesis
James Neal Mullican Mar. 1983 148 p refs
(AD-A129427) Avail: NTIS HC A07/MF A01 CSCL 11/6

This thesis is the first in a series that is attempting to discover the mechanism by which the fracture toughness J sub 1C, of HY-series steel decreases with increasing prestrain at room temperature. This decrease J sub 1C is a function of yield strength and plane strain fracture strain. However, this reduction in J sub 1C is shown to be caused by a reduction in the plane strain fracture strain. Fractographic examinations have verified this reduction in the fracture strain and also have shown that regions of very low ductility exist due to alloy segregation that is present in bands. The mechanism for the degradation in the toughness is believed to be such that stress relieving following prestraining would restore the toughness. Author (GRA)

N83-36192# Louisiana State Univ., Baton Rouge.
CREEP CRACK-OPENING DISPLACEMENT MEASUREMENTS IN In AT 732 C Interim Report, Spe. 1978 - Mar. 1983
William N. Sharpe, Jr. Wright-Patterson AFB, Ohio AFWAL Mar. 1983 48 p refs
(Contract F33615-81-K-5014)
(AD-A130675; AFWAL-TR-83-4006) Avail: NTIS HC A03/MF A01 CSCL 11/6

Creep crack-opening displacement was measured at 732 C (1350 F) using an interference displacement gage and a minicomputer based analysis system to calculate compliance and provide realtime control and analysis. The system, based on a HeNe laser interferometer, was used to measure creep crack growth in IN-100, a nickel-based superalloy. Author (GRA)

N83-36193# Hanford Engineering Development Lab., Richland, Wash.
MECHANICAL BEHAVIOR OF IRRADIATED 20% COLD-WORKED TYPE 316 STAINLESS STEEL SUBJECTED TO A BIAXIAL STRESS STATE
N. S. Cannon and G. D. Johnson Dec. 1982 5 p refs Presented at the Intern. Conf. on Dimensional Stability and Mech. Behavior of Irradiated Metals and Alloys, Brighton, England, 11-13 Apr. 1983
(Contract DE-AC06-76FF-02170)
(DE83-012169; HEDL-SA-2668-S; CONF-830418-5) Avail: NTIS HC A02/MF A01

The controlled biaxial rate (CBSR) test system was used to perform constant temperature, constant diametral strain rate tests on fast reactor cladding. The CBSR test is analogous to conventional uniaxial tests; however, the CBSR stress state is more prototypic of in-reactor transient conditions. Results from CBSR testing of irradiated 20% cold worked Type 316 stainless steel cladding of Fast Flux Test Facility (FFTF) geometry are reported for specimens irradiated in the Experimental Breeder Reactor-II (EBR-II) at temperatures from 370 to 6800 C and fluences to 1.3 to the 23rd power n/sq cm(2). Tests were performed at constant diametral strain rates between 10(+5)/s and 10(+3)/s at constant test temperature ranging from 400 to 7000 C. DOE

N83-36194# Connecticut Univ., Storrs. Dept. of Metallurgy.
THE FATIGUE OF POWDER METALLURGY ALLOYS Annual Report, 1 Dec. 1981 - 30 Nov. 1982
A. J. McEvily, Jr. Jan. 1983 45 p refs
(Grant AF-AFOSR-0046-81)
(AD-A126429; AFOSR-83-0128TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fatigue crack growth in the powder metallurgy alloys X7090-T6, X7091-T7E69, and IN9021-T4 were studied as a function of R ratio in air. Additional tests in a 3-1/2% NaCl environment were also made. The S/N properties of X7090-T6 and X7091-T7E69 were determined. Fatigue data of 7075-T6, an ingot metallurgy product, were obtained for comparison. Attention has focused on the effect of microstructure and crack closure in the near threshold region. Of particular interest was the lack of detectable closure in the IN9021 alloy even at threshold. This alloy had the lowest threshold of the various alloys tested. In one series of tests on X7090-T6 material was removed from behind crack tip in order to understand better the influence of material remote from the crack tip on the closure process. A relatively small effect was found, an indication that closure principally results from near tip contacts. The effect of a 3-1/2% NaCl environment was found to depend on the alloy. DOE

N83-36195# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
RELATIONSHIPS OF IRRADIATION CREEP TO SWELLING IMPLICIT IN THE THEORIES OF THESE PROCESSES
L. K. Mansur and W. A. Coghlan 21 Mar. 1983 6 p refs Presented at the Intern. Conf. on Dimensional Stability and Mech. Behavior of Irradiated Metals and Alloys, Brighton, England, 11 Apr. 1983
(Contract W-7405-eng-26)
(DE83-011390; CONF-830418-4) Avail: NTIS HC A02/MF A01

Theoretical relationships are derived expressing irradiation creep in terms of swelling, for creep by dislocation climb, by climb enabled glide resulting from cumulative net point defect absorption, and by climb enabled glide resulting from cascade induced dislocation climb excursions. In general the creep rate to swelling rate ratio is sensitive to sink densities even for a given swelling level. Implications are seen for translation from one irradiation environment to another. DOE

N83-36196# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
EFFECT OF ORGANIC ADSORBATES ON THE INITIAL STAGE OF ELECTROLYTIC METAL DEPOSITION: DEVELOPMENT AND USE OF A SPECTROSCOPIC ELLIPSOMETER Ph.D. Thesis
Joseph Collin Farmer and Rolf H. Muller Mar. 1983 507 p ref
(Contract DE-AC03-76SF-00098)
(DE83-011737; LBL-15607) Avail: NTIS HC A22/MF A01

The functional role of surface active agents during the initial stage of electrocrystallization was defined. The system selected for investigation involved Cu as the electrode substrate, Pb as the deposited metal, and rhodamine-B chloride as the model inhibitor. The strong absorption band of rhodamine-B in the visible spectrum made it detectable by optical techniques in submonolayer amounts on the electrode. Deposit thicknesses ranged from a single monolayer (the underpotential deposit, UPD) to thicknesses of about 1000 Angstroms. DOE

N83-36197# Sandia Labs., Albuquerque, N. Mex.
ION CHANNELING AND TEM STUDIES OF PULSE-MELTED Fe(Pd) ALLOYS
J. A. Knapp and D. M. Follstaedt 1983 16 p refs Presented at the 6th Intern. Conf. on Ion Beam Analysis, Tempe, Ariz., 22 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-012870; SAND-83-1218C; CONF-830570-2) Avail: NTIS HC A02/MF A01

Metastable Fe(Pd) surface alloys formed by deposition of layers of Pd on (100) Fe and subsequent pulsed electron beam melting into the bcc substrate were investigated by ion backscattering/channeling and TEM. The epitaxial growth of the bcc substrate phase into the alloyed region for successively lower Pd concentrations was examined. The conditions for solidification with the fcc or bcc crystal structure and for metastable phase formation during rapid solidification were investigated. Bcc epitaxy is absent at Pd concentrations greater than or equal to 30 at. %, where an fcc surface layer forms. Channeling of the Pd and Fe signals was observed at Pd concentrations less than or equal to 16.5 at. %, where a single phase, supersaturated bcc alloy is observed. At an intermediate Pd concentration of 22 to 23 at. %, both epitaxial bcc and fcc materials are formed. The observed maximum substitutional Pd concentration in the bcc phase is about a factor of 5 greater than the maxima equilibrium solid solubility. DOE

N83-36198# Hitachi Ltd., Tokyo (Japan). Mechanical Engineering Research Lab.
ELECTROCHEMICAL BEHAVIOR OF PITS DEVELOPED ON ALUMINUM IN A DILUTE CHLORIDE SOLUTION
Yuichi Ishikawa and Hugh S. Isaacs (Brookhaven National Lab., Upton, N.Y.) 1983 5 p refs Presented at the Spring Meeting of the Japan Soc. of Corrosion Engrs., Tokyo, 18 May 1983
(Contract DE-AC02-76CH-00016)
(DE83-013115; BNL-33025; CONF-830575-1) Avail: NTIS HC A02/MF A01

Electrochemical behavior of pits developed on aluminum in 30 ppM chloride ion solution was measured by the scanning vibrating electrode technique (SVET) and compared with that of the total exposed surface. It was found that the pit showed markedly different polarization characteristics compared with the total surface owing to the very different environment and electrochemistry within the pit. Futhermore it was shown that the size of the pit strongly affected the cathodic activity of the pit because of the diffusion effect. An attempt was made to relate the growth rate of the pit to the variation of the open circuit potential of the total surface. DOE

N83-36199# Brookhaven National Lab., Upton, N. Y. Corrosion Science Group.
STRESS RELIEF TO PREVENT STRESS CORROSION IN THE TRANSITION REGION OF EXPANDED ALLOY 600 STEAM-GENERATOR TUBING Final Report
J. Woodward and D. vanRooyen May 1983 50 p refs Sponsored in part by Steam Generator Owners Group
(EPRI Proj. S192-3)
(DE83-902345; EPRI-NP-3055) Avail: NTIS HC A03/MF A01

The feasibility of preventing primary side roll transition cracking has been investigated, using induction heating to attain stress relief of expanded Ni-Cr-Fe Alloy 600 steam generator tubing. Work on rolled tubing and U-bends shows that temperatures with which stress relief can be obtained range from 700 to 8500 C, with lower temperatures in this range requiring longer times at temperature to provide the requisite reduction in residual stresses. Preliminary tests, using induction heating, carried out on a mock tube sheet assembly designed to the dimensions of a typical steam generator, identified the type of heating/cooling cycle that would occur in the tube sheet during a stress relief operation. Preliminary results show that the times to reach the higher temperatures in the range observed to five stress relief, of the order of 8500 C, can be as sort as 8 seconds, and less with optimum coil design and power control. DOE

N83-36200# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
PREPARATION OF DUCTILE NICKEL ALUMINIDES FOR HIGH-TEMPERATURE USES
C. T. Liu, C. C. Koch, and C. L. White 1983 3 p refs Presented at the Symp. on High Temp. Mater., San Francisco, 8 May 1983
(Contract W-7405-eng-26)
(DE83-012579; CONF-830541-2) Avail: NTIS HC A02/MF A01

Intermetallic compounds based on nickel and iron aluminides are attractive for structural applications at elevated temperatures. The major difficulty with using aluminides, such as Ni3Al, as structural materials, however, is their tendency for reported brittle intergranular fracture at low temperatures. This brittleness, which effectively precludes fabrication into most structural components, is extremely sensitive to minor variation in alloy preparation. Recent studies have demonstrated that small boron additions greatly improve the ductility of polycrystalline Ni3Al. Microalloying and stoichiometry effects on the preparation and fabrication of ductile nickel aluminides are studied. Emphasis is also placed on understanding the chemical aspects of microalloying elements (dopants) on composition and cohesion of grain boundaries in Ni2Al. DOE

N83-36201# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
SELECTION OF SLIP SYSTEMS IN LOW-TEMPERATURE DEFORMATION OF NIOBIUM
M. Meshii and Gun Woong Bang 1983 9 p refs Presented at the Intern. Symp. on the Struct. and Properties of Crystal Defects, Liblice, Czechoslovakia, 13-17 Jun. 1983
(Contract DE-AC02-76ER-01367)
(DE83-014986; DOE/ER-01367/146; COO-1367-146; CONF-830680-1) Avail: NTIS HC A02/MF A01

The properties of plastic deformation of bcc metals at low temperatures depend strongly on what type of slips operates predominantly. The slip systems unpredicted from the largest resolved shear-stress rule appear prominently and often control the plastic deformation. Considering the coplanar double slip in addition to the single slip, a new selection rule of slip system is proposed in this paper. The predicted slip systems and the experimental observations are in good agreement. The rule also predicts the orientation dependence of yield stress, which is also found to be in good agreement with the experimental results. DOE

N83-36202# Nebraska Univ., Lincoln. Dept. of Chemistry.
STUDIES ON UNUSUALLY REACTIVE METAL POWDERS. PREPARATION OF NEW ORGANOMETALLIC AND ORGANIC COMPOUNDS INCLUDING POTENTIAL NEW CATALYSTS Progress Report
Reuben D. Rieke 30 Jun. 1983 15 p refs
(Contract DE-AC02-80ER-10603)
(DE83-014962; DOE/ER-10603/T2) Avail: NTIS HC A02/MF A01

Highly reactive metal powders were prepared, and the reactions of these highly reactive metal powders with organic and inorganic substrates was studied. Several reactions which have resulted in the synthesis of many compounds which were therefore unobtainable by standard approaches were developed. Efforts were concentrated on Ni, Cd, U, and Fe. DOE

N83-36203# Auburn Univ., Ala. Dept. of Mechanical Engineering.
STUDY OF THE EFFECTS OF AUSTENITIZING AND TEMPERING HEAT TREATMENTS ON ALLOY HT-9
J. W. Redmon 1982 38 p refs
(Contract DE-AS05-82NE-37900)
(DE83-015651; DOE/NE-37900/2) Avail: NTIS HC A03/MF A01

This paper investigates the potential use of the ferritic alloy Sandvik HT-9 (12 Cr - 1 Mo) as an alternative to stainless steels used in high neutron fluence environments. The neutron radiation influences embrittlement where the impact energy versus test temperature curve is seen displaced to the right. As a result, commercially effective solutioning and tempering processes are needed to suppress this effect in the pre-irradiated condition. The

effects of austenitizing treatments on the impact energy of HT-9 were identified. DOE

N83-36204# Bendix Corp., Kansas City, Mo.
VAPOR-PHASE SOLDERING TECHNIQUES Final Report
E. M. Uthe Jul. 1983 34 p
(Contract DE-AC04-76DP-00613)
(DE83-015353; BDX-613-2957) Avail: NTIS HC A03/MF A01

The general process instructions for vapor phase soldering are given. These instructions discuss reflow soldering, rework of discrepant material, and maintenance and calibration of the equipment involved. The requirements for soldering discrete components to thick film conductors is also discussed, along with quality assurance and packaging requirements for those components. DOE

N83-36205# Sandia Labs., Albuquerque, N. Mex.
WAVE PROPAGATION AND CAVITATION IN METALS
Lee Davison 1983 5 p refs Presented at the Workshop on Media with Microstruct. and Wave Propagation, Houghton, Mich., 24 Jan. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013998; SAND-82-3004C; CONF-830141-3) Avail: NTIS HC A02/MF A01

The theory of materials with internal state variables is advanced as an especially convenient means of representing certain microstructural features in a way that not only appeals to both the continuum theoretician and the materials scientist but also lends itself to numerical solution of problems. The important points are illustrated by the example of a theory for viscoplastic flow and cavitation of ductile metals. DOE

N83-36206# Denver Univ., Colo. Dept. of Physics.
DETECTION OF HYDROGEN-ASSISTED CRACK GROWTH Progress Report, 1 Dec. 1982 - 30 Dec. 1983
Steve H. Carpenter and Clinton R. Heiple (Rockwell International Corp., Golden, Colo.) Jul. 1983 31 p
(Contract DE-AC02-81ER-10958)
(DE83-016046; DOE/ER-10958/2) Avail: NTIS HC A03/MF A01

Internal friction measurements were carried out to provide insight and information on hydrogen-dislocation interactions. Data on the change in elastic modulus, internal friction, changes in lattice constant and crack volume due to the cathodic charging of samples of pure iron are reported. Similar data generated during a series of heat treatments following cathodic charging are included. Modulus and internal friction data on samples deformed past yield and then cathodically charged while maintained under load. All magnetic effects were saturated and the hydrogen-dislocation interactions were interrogated directly. Data on the hydrogen-dislocation interactions in pure iron are presented. The acoustic emissions generated during the pressurization and subsequent pressure holds of small pressure vessels with high pressure hydrogen and helium gas were measured and characterized to determine if acoustic emission monitoring can detect crack initiation and/or growth in real structures exposed to high pressure hydrogen environments. Author

N83-36207# Auburn Univ., Ala. Dept. of Mechanical Engineering.
THE EFFECT OF AUSTENITIZING AND TEMPERING HEAT TREATMENTS ON THE CARBIDE PRECIPITATION IN THE ALLOY HT-9
M. A. Stone 1983 49 p refs
(Contract DE-AS05-82ND-37900)
(DE83-015655; DOE/NE-37900/3) Avail: NTIS HC A03/MF A01

Carbide precipitation in the alloy HT-9 was investigated. For specimens tempered at 650 C, 700 C and 7500 C, the amount of carbide precipitation was found to be independent of the austenitizing temperature. For specimens tempered at 8000 C, the carbide precipitation varied as a function of austenitizing temperature. The maximum carbide precipitation for an 8000 C temper treatment occurred at 11750 C austenitizing temperature. Carbide size at constant tempering temperature varied as a function of austenitizing temperature for all temper treatments. Samples austenitized at 11000 C and tempered at 6500 C show an unusually high carbide size in relation to other samples tempered at 6500 C. Carbide size as a function of tempering temperature increased with increasing austenitizing temperature. DOE

N83-36208# Rockwell International Corp., Golden, Colo. Energy Systems Group.
PROCESS FOR SYNTHESIS OF PHOSPHONIC ACIDS AND PHOSPHINIC ACIDS
Hans-Dieter Block and Heinrich Kohnen Jun. 1983 6 p Transl. into ENGLISH of West German Patent 2,745,982 (1979)
(Contract DE-AC04-76DP-03533)
(DE83-013879; RFP-ABST-06) Avail: NTIS HC A02/MF A01

A process is claimed for the synthesis of phosphonic and phosphinic acids by hydrolysis of the corresponding esters. The phosphonic and phosphinic acids produced act as catalysts in the process, which is characterized by the fact that the hydrolysis proceeds under high pressure and that the reaction mixture contains at least twice as many moles of water as the number of moles of acid hydroxyl groups to be formed and/or present. The reaction proceeds under autogenous pressure and at temperatures between 105 and 2350 C. At the end of saponification, the aqueous solutions of phosphonic and phosphinic acids can be used as is, or the acids can be purified by recrystallization, etc. and converted to salts with suitable bases. The yields are practically quantitative. The products can be used as corrosion inhibitors and sequestering agents, and represent valuable intermediate products for synthesis of other corrosion inhibitors, sequestering agents, flame retarders, textile auxiliaries and antistatic compounds. DOE

N83-36209# ECA, Inc., Lisle, Ill.
METAL CORROSION ASSOCIATED WITH THERMAL CYCLING OF INHIBITED AND UNINHIBITED PROPYLENE GLYCOL/ WATER SOLUTION IN SOLAR DHW SYSTEMS
Craig F. Cheng Apr. 1983 24 p
(Contract W-31-109-eng-38)
(DE83-014266; ANL-83-33) Avail: NTIS HC A02/MF A01

As part of the Solar Reliability and Materials Program at Argonne National Laboratory, metal corrosion associated with thermal cycling at 82 C circulating and 176 C stagnating temperatures of propylene glycol and ASTM corrosive water mixture (50% v/o) was investigated. Preliminary data indicate that in a mixed metal system of copper, steel, and aluminum specimens stagnating together in a glycol solution, the copper randomly pits and the pitting stops when the pit depth extends to about 1-1/2 mil. The addition of 1% molybdate as an inhibitor to the glycol solution is slightly beneficial for steel, but the added expense of adding and maintaining the concentration of an inhibitor may not be warranted. Dissolved copper rapidly deposits on the aluminum surface and promotes severe galvanic corrosion. DOE

N83-36210# Auburn Univ., Ala. Dept. of Mechanical Engineering.
THE EFFECTS OF AUSTENITIZING AND TEMPERING HEAT TREATMENTS ON THE IMPACT ENERGY OF ALLOY HT-9
D. R. Dobbs 1982 32 p refs
(Contract DE-AS05-82NE-37900)
(DE83-015652; DOE/NE-37900/1) Avail: NTIS HC A03/MF A01

Based on the data acquired in this study, the effects of austenitizing and tempering heat treatments on the impact energy of HT-9 can not be completely known or understood. The Charpy-impact transition temperature (ITT) was depressed 380 C by decreasing the austenitizing temperature from 10000 C to 9000 C. However a decrease from 11000 C to 10500 C produces an increase in the ITT of 400 C. The lowest ITT was found to occur at -100 C. This condition was produced by an austenitization at 11000 C. An inverse relationship between grain size and ITT was found to exist in the range of grain sizes from 4 to 8. At a grain size of 3, the ITT was found to be -100 C and the inverse relationship is invalid. Further research is needed in the range of larger grain sizes. DOE

N83-36211# California Univ., Los Angeles. School of Engineering and Applied Science.
IRRADIATION INDUCED PRECIPITATION IN PALLADIUM-BASE ALLOYS Annual Progress Report, 1 Apr. 1982 - 31 Mar. 1983
A. J. Ardell Apr. 1983 54 p
(Contracts DE-AT03-76ER-70294; DE-AM03-765F-00034)
(DE83-012085; DOE/ER-70294/T1; APR-5) Avail: NTIS HC A04/MF A01

Research is summarized on: irradiation-induced precipitation (IIP) in Pd-Mo concentrated Pd-Cr alloys; irradiation damage in Pd-Cr, Pd-Mn, and Pd-V; and irradiation effects in metallic glasses. DOE

N83-36212# Hanford Engineering Development Lab., Richland, Wash.
LITHIUM-SYSTEM CORROSION/EROSION STUDIES FOR THE FMIT PROJECT
G. D. Bazinet, comp. Apr. 1983 173 p refs
(Contract DE-AC06-76FF-02170)
(DE83-014398; HEDL-TME-82-42) Avail: NTIS HC A08/MF A01

The corrosion behavior of selected materials in a liquid lithium environment was studied in support of system and component designs for the fusion materials irradiation test (FMIT) facility. Test specimens in the form of material coupons to complete assemblies, in the case of potential valve and valve bellows designs, were satisfactorily evaluated to determine corrosion rates, fatigue crack growth rates, and structural compatibility of materials specified for the lithium system application. DOE

N83-36213# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
CORROSION OF AN Fe-12 Cr-1 Mo VW STEEL IN THERMALLY-CONVECTIVE LITHIUM
P. F. Tortorelli and J. H. DeVan 1983 7 p refs Presented at the TMS/AIME Top. Conf. on Ferritic Alloys for use in Nucl. Energy Technol., Snowbird, Utah, 19 Jun. 1983
(Contract W-7405-eng-26)
(DE83-014012; CONF-830659-1) Avail: NTIS HC A02/MF A01

A thermal convection loop of Fe-12 Cr-1 Mo VW steel circulated pure lithium between 500 and 3500 C for 10.088 h. Periodic weighings of coupons at different temperatures around the loop revealed small weight losses and corrosion rates. Surface analysis showed a relatively thin corrosion layer with an underlying carbide-free zone and some depletion of chromium from the hottest specimen. While some mass transfer of chromium and nickel was detected, this mechanism did not strongly influence the weight loss process as it does with austenitic steels. Therefore, it appeared that reactions with carbon and nitrogen must be the dominant corrosion processes such that weight loss was maximized at the lowest temperature (3500 C). Overall, the lithium-steel reactions in the temperature range of this experiment were relatively sluggish and the corrosion was not severe. DOE

N83-36214# Nippon Steel Corp., Tokyo (Japan).
[PREVENTIVE EQUIPMENT MAINTENANCE AND INSPECTION: NONDESTRUCTIVE TESTING]
1982 178 p refs
(PB83-159806; NIPPON-STEEL-TR-19; ISSN-0300-306X) Avail: NTIS HC A09/MF A01 CSCL 11F

Contents: development of a predictive maintenance system at Sakai Works; development and application of machine diagnostics; prolonging the life of steel-making machinery; fatigue fracture and stress analysis for stand housings of rolling mills; maintenance of large electric motors; flame gunning repair of coke ovens; methods of analysis for towing, launching and upending of jackets; development of fatigue-resistant sockets; high-speed automatic welding system for submarine pipelines; and ultrasonic examination of T-,K- and Y-shaped tubular joints of offshore structures. GRA

N83-36215*# National Bureau of Standards, Washington, D.C.
THE NBS: PROCESSING/MICROSTRUCTURE/PROPERTY RELATIONSHIPS IN 2024 ALUMINUM ALLOY PLATES
L. K. Ives, W. J. Swartzendruber, W. J. Boettinger, M. Rosen, and S. D. Ridder Apr. 1983 270 p refs
(NASA Order W-14637)
(NASA-CR-173096; NAS 1.26:173096; PB83-207696; NBSIR-83-2669) Avail: NTIS HC A12/MF A01 CSCL 11F

As received plates of 2024 aluminum alloy were examined. Topics covered include: solidification segregation studies; microsegregation and macrosegregation in laboratory and commercially cast ingots; C-curves and nondestructive evaluation; time-temperature precipitation diagrams and the relationships between mechanical properties and NDE measurements; transmission electron microscopy studies; the relationship between microstructure and properties; ultrasonic characterization; eddy-current conductivity characterization; the study of aging process by means of dynamic eddy current measurements; and Heat flow-property predictions, property degradations due to improve quench from the solution heat treatment temperature. GRA

N83-36216# United Kingdom Atomic Energy Authority, Harwell (England). Chemistry Div.
THE SYNTHESIS AND CHARACTERIZATION OF MAGNETITES AND NICKEL FERRITES
G. Raw Apr. 1983 37 p refs
(AERE-R-1077) Avail: NTIS HC A03/MF A01; HMSO £3; PHI

The final stoichiometry of magnetite samples prepared by a precipitation procedure in the absence of air was found to be highly dependent on the rate of air oxidation after precipitation is completed. Coprecipitated nickel and iron hydroxides and hydrated oxides, which react to form nickel ferrite during high temperature calcination, were treated hydrothermally in attempts to prepare nickel ferrite at low (approximately < 300 C) temperatures. Transmission Fe57 Moessbauer spectroscopy was used to characterize the reaction products in this preliminary study. Author

N83-36217# United Kingdom Atomic Energy Authority, Harwell (England). Theoretical Physics Div.
AN ANALYSIS OF GRAIN BOUNDARY FAILURE IN AUSTENITIC STAINLESS STEEL
X. L. Kear and M. H. Wood May 1983 24 p refs
(AERE-R-10907) Avail: NTIS HC A02/MF A01; HMSO £3; PHI

Metals subjected to an applied stress often fracture along the grain boundaries through the nucleation and growth of cavities. Many mechanisms of nucleation and growth generally interact in a complex way. The grain boundary diffusion, source control of vacancies, and plastic growth by dislocation creep mechanisms for the control of cavity growth are considered. They are employed to analyse experimental results of time-to-rupture for various stresses applied to samples of austenitic stainless steels. Good agreement is found between experiment and theory over a range of temperature for unirradiated, helium pre-implanted, and neutron pre-irradiated material. It is found that the source control of vacancies or plastic growth by dislocation creep mechanisms determine the time-to-rupture for such steels. Author

N83-36218# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics and Materials Development Div.
THIN LAYER ACTIVATION: A NEW PLANT CORROSION-MONITORING TECHNIQUE
J. Asher, T. W. Conlon, B. C. Tofield, and N. J. M. Wilkins Mar. 1983 21 p refs
(AERE-R-10371) Avail: NTIS HC A02/MF A01; HMSO £3; PHI

The first results from plant scale demonstrations or thin layer activation (TLA) are reported. The basis of the technique is to introduce a small quantity of radioisotope tracer into the surface of a coupon or plant component of interest. Material lost by corrosion or other processes can than be monitored remotely and with high sensitivity. TLA is already well established as a technique possessing unique advantages in the measurement of wear and erosion, particularly in oil and automobile industry research laboratories. The industrial scale demonstrations reported bear witness to its utility as a technique for on-line corrosion monitoring. Author

N83-36219# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
PERMEATION OF GASES THROUGH SOLIDS. PART 3: AN ASSESSMENT OF MEASUREMENTS OF THE STEADY STATE PERMEABILITY OF H AND ITS ISOTOPES THROUGH Ni AND THROUGH SEVERAL HIGH Ni COMMERCIAL ALLOYS AND STEELS
A. D. LeClaire Mar. 1983 40 p refs
(AERE-R-10846) Avail: NTIS HC A03/MF A01; HMSO £3; PHI

Reported measurements of the permeability P(m) to H and its isotopes of pure Ni and of several high Ni content alloys are assessed. For pure Ni, Robertson's (1973) "best value" is still appropriate. For Incoloys all measured P(m) lie within a factor 1.5 either way of P(m) = 0.04 exp (-15 kcal. mol /1/RT) ccs (STP) /cm /s 1/2 atm. For Inconels 600, 617 and 625 all data are within a factor 1.5 either way of P(m) = .057 exp-16/RT (same units), but P(m) for Inconel 718 is better represented by P(m) = .075 exp -13.4/RT. For Hasteloy X P(m) = .053 exp-15.66/RT, and the P(m) for Hasteloys N and B may be quite similar. It is evident that the permeabilities of these series of alloys are relatively insensitive to quite large composition changes. They are on average about 2 to 4 times larger than those of the austenitic stainless steels. In the same general range are the permeabilities of many other high Ni alloys, Nichrome, Kovar, Ceramvar, Niromet, Monel etc. Oxide layers on many of these alloys greatly impede permeation. Author

N83-36269# Hokkaido Univ., Sapporo (Japan).
CHANGES OF GRAPHITE PHASE IN GROWN FERRITIC S.G. CAST IRON
Makoto Soma and Kingo Nagaoka *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 35-46 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N83-36220* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS AND METHOD FOR HEATING A MATERIAL IN A TRANSPARENT AMPOULE Patent
Lawrence R. Holland, inventor (to NASA) (Athens State Coll., Ala.) Issued 11 Oct. 1983 8 p Filed 30 Jun. 1981 Supersedes N81-30012 (19 - 20, p 2851) Sponsored by NASA
(NASA-Case-MFS-25436-1; US-Patent-4,408,658; US-Patent-Appl-SN-280151; US-Patent-Class-165-2; US-Patent-Class-165-58; US-Patent-Class-219-354; US-Patent-Class-219-390; US-Patent-Class-219-343; US-Patent-Class-219-411; US-Patent-Class-156-600; US-Patent-Class-156-610; US-Patent-Class-156-DIG.73; US-Patent-Class-156-DIG.89; US-Patent-Class-350-316) Avail: US Patent and Trademark Office CSCL 11G

An improved process for heating a material within a fused silica ampoule by radiation through the wall of the ampoule, while simultaneously passing a cooling gas around the ampoule is described. The radiation passes through a screen of fused silica so as to remove those components capable of directly heating the silica, therby increasing the temperature of the material within the ampoule above the strain point of the ampoule, while maintaining the exterior of the ampoule cool enough to prevent rupturing the amp. Official Gazette of the U.S. Patent and Trademark Office

N83-36221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENT REQUIREMENTS AND IMPLEMENTATION PLAN (ERIP) FOR SEMICONDUCTOR MATERIALS GROWTH IN LOW-G ENVIRONMENT
R. K. Crouch; A. L. Fripp, W. J. Debnam, and I. O. Clark Sep. 1983 31 p refs
(NASA-TM-85698; NAS 1.16:85698) Avail: NTIS HC A03/MF A01 CSCL 11G

The MEA-2 A facility was used to test the effect of the low gravity environment on suppressing convective mixing in the growth of Pb(1-x)Sn(x)Te crystals. The need to eliminate convection, the furnace characteristics and operation that will be required for successful experimental implementation, and to the level that is presently known, the measured physical properties of the Pb(1-x)Sn(x)Te system were discussed. In addition, a brief background of the present and potential utilization of Pb(1-x)Sn(x)Te is given. Additional experiments are anticipated in future MEA-A, improved MEA and other dedicated materials processing in space flight apparatus. Author

N83-36222# National Mechanical Engineering Research Inst., Pretoria (South Africa).
HIGH-DUTY FIBRE-REINFORCED PLASTICS
M. S. Hunt Feb. 1982 19 p
(CSIR-ME-1741; ISBN-0-7988-1487-X) Avail: NTIS HC A02/MF A01

The superior structural properties of fiber reinforced composites will make the 21st century known as the era of composite materials. The reason for the slow takeoff experienced to date is the completely new manufacturing techniques required in order to make use of composite materials. The mass production methods for which metals are so suitable cannot be applied until a completely new range of automatic equipment is developed. The high duty structural components which are being successfully manufactured at present, have a fairly high labor content. On the other hand capital costs can be very low. Fiber reinforced composites are particularly suitable for industrial applications in countries where production quantities are relatively low and semiskilled labor costs are also low. For this reason the manufacturing industry in this country is ideally suited for major developments in the use of composite materials. Author

N83-36223# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
COLLOID-CHEMICAL AND TECHNOLOGICAL PROPERTIES OF AN ARTIFICIAL AQUEOUS DISPERSION OF A NATURAL LATEX MIXTURE OF cis-1,4-POLYISOPRENE
J. V. Grubman 1982 8 p refs Transl. into ENGLISH from Kaucuk i Rezina (USSR), no. 10, 1981 p 10-13
(CSIR-Trans-1648) Avail: NTIS HC A02/MF A01

Natural latex is used in the manufacture of articles for technical and medical use by a process of ionic deposition. The possibility of substituting imported raw material by locally produced materials with similar properties is to be considered. Processed aqueous dispersion of SKI-3 synthetic cis-1,4-polyisoprene (DSKI-3) contains no polymer gel fraction; this hampers ionic deposition, drying and vulcanization and results in insufficiently high gel strength and low vulcanizate tear resistance, and consequently complicate the use of this dispersion for producing goods from latex by the ionic deposition method. These difficulties can be overcome by using a mixture of DSKI-3 and natural latex. The colloid-chemical and technological properties of a mixture of DSKI-3 and natural latex, and the properties of the vulcanizates obtained, were accordingly investigated. The results of the tests prompted the use of "Kvaliteks" centrifuged natural latex and DSKI-3 stabilized by a potash soap of disproportionated resin (PSDR). The concentration of the natural latex and the DSKI-3 was 60%. Author

N83-36224# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF POLYMER STRUCTURE ON MECHANICAL PROPERTIES OF cis-POLYISOPRENE MODIFIED BY POLYSTYROL DURING THE LATEX STAGE
N. V. Ermilova 1982 5 p refs Transl. into ENGLISH from Kaucuk i Rezina (USSR), no. 7, 1981 p 24-25
(CSIR-Trans-1644) Avail: NTIS HC A02/MF A01

Inoculation of 20% by mass of polystyrol (PS) into cis-polyisoprene during the latex stage permits increases of up to 15% in the strength of the vulcanized films with no loss of elasticity. Increase in the strength of vulcanizates prepared from SKI-3 and PS-100 latex compositions is smaller and is accompanied by a decrease in elasticity. The difference in mechanical properties between the inoculated and mixed compositions depends on the following structural factors: differing distribution of PS in the rubber matrix; interaction between PS and cis-polyisoprene; difference in the interface surface area between the inoculated and mixed compositions and consequent difference in the amount of polymer situated in the polymer-polymer interfaces; formation of chain-branching structures from globules of PS in the mixture compositions. A.R.H.

N83-36225# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Chemistry.

PHYSICAL-CHEMICAL PROPERTIES OF ARTICULATED RODLIKE POLYMERS Final Report, 1 Mar. 1981 - 28 Feb. 1982

G. C. Berry, Y. Einaga, R. Furukawa, L. Marwaha, and H. H. Tsai Wright-Patterson AFB, Ohio AFWAL Aug. 1982 166 p refs

(Contract F33615-81-K-5043; AF Proj. 2419)

(AD-A129049; AFWAL-TR-82-4090) Avail: NTIS HC A08/MF A01 CSCL 11/9

Photon correlation and absolute intensity light screening studies have been coupled with size exclusion chromatography, viscometry and spectroscopic studies to investigate several articulated polymers. The results show that the polymers investigated tend to form intermolecular aggregates in solution. The effect of these can be reduced in number by increased temperature, sonication and centrifugation, but not completely removed. Results on solutions so treated are presently being analyzed in terms of a quasi-two component mixture of large aggregates (few in number) and molecularly dissolved species. Phase equilibria studies show that articulated polymers can form nematogenic solutions with the tendency increased with decreasing content of non-rodlike comonomer, as expected. For reasons unknown in detail, SPBT copolymers more readily form nematogenic solutions than do SPBO copolymers--a possible explanation may rest with increased intermolecular aggregation with SPBO copolymers. The critical concentration cc for stability of the nematic phase appears to be increased for rodlike polymers in polyphosphoric acid, PPA, as compared with methane sulfonic acid, MSA. This may reflect complex formation with PPA, effectively increasing the chain diameter. Mixtures of a nematogenic rodlike chain and an isotropic articulated chain exhibit depressed cc, as expected. Nonetheless, physical separation of the phases appears to be very difficult with the system studied thus far. Rheological data including measurements of the creep, recovery and dynamic compliances on solutions of an articulated rodlike copolymer in MSA are interpretted in terms of interchain association that is susceptible to cleavage and reformation in flow. Author (GRA)

N83-36226# Brown Univ., Providence, R. I. Dept. of Chemistry.

SYNTHESIS AND SPECTRAL STUDY OF LOW DIMENSIONAL POLY-YNE POLYMERS CONTAINING PHTHALOCYANINE SILICON AND DIMETHYL SILICON IN THE POLYMER BACKBONE

Il Wun Shim and William M. Risen, Jr. 13 Jun. 1983 21 p refs

(Contract N00014-75-C-0883)

(AD-A130580; TR-83-05) Avail: NTIS HC A02/MF A01 CSCL 11/9

A pseudo one dimensional poly-yne polymer (1) in which phthalocyanine silicon (PcSi) moities are bridged by p-diethynyl benzo groups has been obtained by salt elimination reaction from dichloro phthalocyaninato silicon and the disodium salt of p-diethynyl benzene in tetrahydrofuran (THF) solution. A soluble mixture of short chain oligomers of this polymer was also obtained. For parallel study, an analogous low dimensional poly-yne polymer (3) was synthesized by reaction of dimethyl dichloro silicon with disodium salt of diethynyl benzene in either solution. Materials (1) and (3) were found to be stable in air and have good thermal stability. These two polymers were characterized by spectral and analytical data. Author (GRA)

N83-36227# McDonnell-Douglas Corp., Long Beach, Calif. Aircraft Div.

ADHESIVE LAYER THICKNESS AND POROSITY CRITERIA FOR BONDED JOINTS Final Report, Aug. 1980 - Sep. 1982

L. J. Hart-Smith Wright-Patterson AFB, Ohio AFWAL Dec. 1982 163 p refs

(Contract F33615-80-C-5092; AF Proj. 2419)

(AD-A129817; AFWAL-TR-82-4172) Avail: NTIS HC A08/MF A01 CSCL 13/8

This investigation is concerned with two aspects of the effects of imperfections in adhesive bonds. These imperfections are nonuniform thickness and porosity (or, in the extreme case, flaws). Both cause redistribution of the load transfer with respect to that for nominally perfect bonds. A thorough treatment of induced peel stresses in structural joints and test coupons is included because the growth of bond flaws is known to be associated more with peel stresses than shear stresses in the adhesive. The report covers both the ductile adhesives most suitable for subsonic transport aircraft and the brittle adhesives needed for supersonic military aircraft. The first major section of the report discusses the effects of adhesive layer thickness variation, with particular emphasis on the ends of bonded overlaps where peak load transfer inevitably occurs. The second major topic is that of flaws and porosity; and it is shown that adhesive bonded joints are far more tolerant of such naturally occurring imperfections than is generally recognized. The final subject is that of peel stresses induced in the adhesive layer due to eccentricities in load path. While it is known that such peel stresses can be very detrimental to the life of bonded joints, it is shown here that it is often quite simple to eliminate them from structurally proportioned joints. GRA

N83-36228# IBM Research Lab., San Jose, Calif. Research Div.

FOURIER TRANSFORM INFRARED STUDY OF THE POLYMER-DOPANT INTERACTION IN POLYACETYLENE

J. F. Rabolt, T. C. Clarke, and G. B. Street 7 Apr. 1983 19 p refs Submitted for publication

(Contract N00014-80-C-0779)

(AD-A129548; TR-9) Avail: NTIS HC A02/MF A01 CSCL 11/9

Fourier Transform Infrared (FTIR) measurements of AsF5 doped (CH)x with dopant concentrations which vary over three orders of magnitude have been obtained in both the mid (4000-400 1/4000-400 cm) and far (1/400-15 cm) infrared. The bandwidths of the strong bands characteristics of the doped polymer have been observed to be invariant with dopant concentration. However, the frequency positions of these new IR bands are found to be sensitive function of the dopant level. In the far infrared, no evidence of the predicted soliton pinning mode was found for any of the dopant concentrations studied. The consequence of these results in view of current theoretical models of the polymer-dopant interaction is discussed. Author (GRA)

N83-36229# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

STRENGTHENING AND STRENGTH UNIFORMITY OF STRUCTURAL CERAMICS Annual Report, 1 Feb. 1982 - 31 Jan. 1983

F. F. Lange May 1983 85 p refs

(Contract F49620-81-C-0036; AF Proj. 2306)

(AD-A129570; AFOSR-83-0531TR; SC5295.2AR; AR-2) Avail: NTIS HC A05/MF A01 CSCL 11/2

Stresses created by differential sintering, due to differences in initial bulk density, were determined experimentally. The experiments entailed determining the shrinkage rates of a powder isostatically pressed to two different bulk densities. Using this information, stresses were determined by forcing the slower densifying compact to shrink at the same rate as the faster densifying compact and measuring the resulting forces with a load cell. Maximum stresses (between 200 and 400 psi) were observed to occur in the intermediate stage of densification. Despite larger

differential strains at higher temperatures, stresses decreased to zero at the latter stage of densification. Viscoelastic experiments, of the stress relaxation type were performed. Results showed that the sintering specimen was more rigid at lower temperatures and more fluid-like at higher temperatures, to explain the development of maximum stresses at intermediate temperatures. GRA

N83-36230# Case Western Reserve Univ., Cleveland, Ohio.
THE STRUCTURE OF POLYURETHANE ELASTOMERS Final Report, 1 Mar. 1976 - 30 Sep. 1982
John Blackwell 14 Jun. 1983 23 p refs
(Contract DAAG29-76-C-0070; Grant DAAG-76-G-0152)
(AD-A130022; ARO-13435.5-CH; ARO-16357.9-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Polyurethane elastomers derive their properties from phase separation into hard (urethane) and soft (polyether or polyester) domains. We have used X-ray diffraction and conformational analysis to determine the structure of the hard domains in MDI/diol/polyester polyurethanes. A new structure has been developed for MDI/butandiol (C4) hard segments, based on the following approaches. Solution of structures of two MDI derivatives showed the basic features of the polymer conformation, packing, and hydrogen bonding. Better quality X-ray patterns allowed determination of the unit cell. Potential energy conformational analysis was applied to polyurethanes for the first time. The results point to a fully extended poly(MDI/butandiol) chain linked to its neighbors in a stabilizing two dimensional hydrogen bonding network. This work was expanded to the polyurethanes prepared using the C2-C8 homologous series of diols. The even diol series (except C2) adopt fully extended structures like that for the C4 polymer. In contrast the odd diol series adopt higher energy contracted conformations, probably in order to form intermolecular hydrogen bonds. GRA

N83-36231# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
ION TRANSPORT IN THE POLYMER ELECTROLYTES FORMED BETWEEN POLY(ETHYLENE SUCCINATE) AND LITHIUM TETRAFLUOROBORATE Interim Report
R. Dupon, B. L. Papke, M. A. Ratner, and D. F. Shriver 9 May 1983 17 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-80-C-0532; NR Proj. 359-746)
(AD-A129635; REPT-006) Avail: NTIS HC A02/MF A01 CSCL 07/4

Solid electrolyte complexes of poly(ethylene succinate), PESc, and LiBF4 were proposed from the melt and found to be the compound amorphous over the polymer repeat unit to salt formula unit range of 1:1 to 3:1. Preparations with larger amounts of salt contained a pure salt phase, and at salt concentrations below the 3:1 ratio, free crystalline polymer was observed. Within the 1:1 to 3:1 concentration range, increasing salt concentration was accompanied by decreasing conductivity, and increasing glass transition temperatures. This behavior is discussed in terms of a Gibbs-Adams-like excess entropy model. Author (GRA)

N83-36232# IBM Research Lab., San Jose, Calif.
CHARACTERIZATION OF POLYPYRROLE
G. B. Street, T. C. Clarke, R. H. Geiss, V. Y. Lee, A. Nazzal, P. Pfluger, and J. C. Scott 7 Apr. 1983 21 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A129492; TR-13) Avail: NTIS HC A02/MF A01 CSCL 20/8

Using Beta/Beta prime dimethypyrrole polymers to reduce the structural disorder it has been possible to interpret the results of electron diffraction data and to propose and idealized structure for neutral polypyrrole. XPS data have been used to define some of the deviations from this ideal structure that are seen in actual films and the origin of some of these defects is related to the mechanism of polymerization. The planarity of the chain structure is shown to be important for high conductivity in pyrrole polymers which appears to involve spinless carriers perhaps associated with bipolarons. Author (GRA)

N83-36233# Northwestern Univ., Evanston, Ill. Materials Research Center.
STOICHIOMETRY AND CONDUCTIVITY RESPONSE OF AMORPHOUS AND CRYSTALLINE COMPLEXES FORMED BETWEEN POLY-(ETHYLENE OXIDE) AND AMMONIUM SALTS Interim Technical Report
M. Stainer, L. C. Hardy, D. H. Whitmore, and D. F. Shriver 9 May 1983 27 p refs Submitted for publication
(Contract N00014-80-C-0532; NR Proj. 359-746)
(AD-A129489) Avail: NTIS HC A03/MF A01 CSCL 11/9

A single crystalline phase having the approximate composition 4:1 PEO NH4SCN was identified, and an approximate phase diagram was constructed. The PEO.NH4S03CF3 system is more complex and a phase diagram was not obtained, however, at least two compounds of 8:1 and 4:1 stoichiometry are indicated. Conductivity plots indicate that the metastable amorphous phase of the various materials has a conductivity approximately higher than that of the crystalline phase at room temperature. Author (GRA)

N83-36234# IBM Research Lab., San Jose, Calif.
ELECTRICALLY CONDUCTING POLYMERS
W. D. Gill, T. C. Clarke, and G. B. Street 7 Apr. 1983 84 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A129488; TR-8) Avail: NTIS HC A05/MF A01 CSCL 07/3

The purpose of this chapter is to describe some of the physics and chemistry of highly conducting polymer systems ranging from the inorganic (SN)x to organic materials such as (CH)x, polypyrrole and the polyphenylenes (17). It would be very difficult in a single chapter to adequately review the already extensive literature on these materials. Presented is a coherent overview of the current status of highly conductive polymers with reference to several review articles for a more extensive survey of the literature. GRA

N83-36235# IBM Research Lab., San Jose, Calif.
THE CHEMICAL AND PHYSICAL PROPERTIES OF PYRROLE-BASED CONDUCTING POLYMERS: THE CHARACTERIZATION OF AS-GROWN FILMS BY X-RAY PHOTOEMISSION SPECTROSCOPY
P. Pfluger and G. B. Street 7 Apr. 1983 34 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A129486; TR-15) Avail: NTIS HC A03/MF A01 CSCL 11/9

XPS techniques have been used to characterize electrically conducting films of polypyrrole and polybithiophenes grown electrochemically. These techniques have yielded information not only on the nature of the polymeric cation and its counter anion but also on the structural disorder in these polymers. In particular the N1s spectra have revealed a non-uniformity in the distribution of the anions relative to the nitrogen atoms and the C1s spectra clearly show that approximately 1/3 of the pyrrole rings are different from the rest. Significant improvement in the structural order is achieved by blocking the beta sites on the pyrrole ring with methyl groups to ensure a completely bonded polymer. Similar experiments on polybithiophene polymers show that this polymer is considerably more ordered than polypyrrole. GRA

N83-36236# IBM Research Lab., San Jose, Calif.
THE CHEMICAL AND PHYSICAL PROPERTIES OF PYRROLE-BASED CONDUCTING POLYMERS: THE OXIDATION OF NEUTRAL POLYPYRROLE
P. Pfluger, M. Krounbi, G. B. Street, and G. Weiser 7 Apr. 1983 22 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A129485; TR-14) Avail: NTIS HC A02/MF A01 CSCL 11/9

A series of experiments on the physics and chemistry of polymers derived from pyrroles, show that the oxidation of neutral

insulating polypyrrole (PPo) to its conducting counterpart (PP+) is a multistep process. In particular, the conductivity of the polymers increases only in the early stages of oxidation whereas significant changes in the optical and EPR properties occur in later stages of the oxidation when no further changes in the conductivity take place. The early stages of oxidation lead to an ionic (PP+ anion) polymer and the later stages of oxidation result in chemistry at the nitrogen atoms of the pyrrole rings. Similar behavior is observed for all the oxidized pyrrole polymers independent of the method of oxidation. Author (GRA)

N83-36237# IBM Research Lab., San Jose, Calif.
MAGIC ANGLE SPINNING NMR OF CONDUCTING POLYMERS
T. C. Clarke, J. C. Scott, and G. B. Street 7 Apr. 1983 25 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A129484; TR-10) Avail: NTIS HC A02/MF A01 CSCL 07/4

Because of their typically intractable nature, conducting polymers as a class of materials have proved particularly difficult to characterize by the conventional techniques of polymer analysis. Presented here are examples of the application of a powerful new tool, cross-polarization magic angle spinning (CPMAS) 13C NMR spectroscopy, to the investigation of the structure and reactions of the conducting polymers polyacetylene and polypyrrole. Author (GRA)

N83-36238# Dayton Univ., Ohio.
RAIN EROSION MECHANISMS OF FLUOROELASTOMER AND POLYURETHANE COATINGS ON SELECTED COMPOSITE SUBSTRATES Special Interim Report, Jul. 1980 - Feb. 1983
Charles J. Hurley, Joseph Zahavi, and George F. Schmitt Wright-Patterson AFB, Ohio AFWAL Apr. 1983 76 p refs
(Contracts F33615-81-C-5030; F33615-82-C-5039; F33615-79-C-5129)
(AD-A129580; AFWAL-TR-83-4039) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report documents a test program which was conducted to evaluate the rain erosion resistance of selected coated composite materials at 30 degrees and 90 degrees impact angles in a 1 inch/hour rainfall at 500 mph. Tests included: weight loss, percent coating removal, and SEM examinations. GRA

N83-36239# Sandia Labs., Albuquerque, N. Mex.
SOL-GEL DERIVED AR COATINGS
C. J. Brinker and R. B. Pettit 1983 13 p refs Presented at the Distributed Solar Collector Conf., Albuquerque, N. Mex., 15 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE83-007031; SAND-83-1060C; CONF-830316-1) Avail: NTIS HC A02/MF A01

Porous sol-gel derived films prepared from aged polymeric solutions were deposited on PYREX and etched to produce AR coatings with solar averaged transmittance values greater than 0.97. This process appeared to produce single layer interference films rather than graded index films. DOE

N83-36240# Sandia Labs., Albuquerque, N. Mex.
HYSTERESIS EFFECTS IN DEFORMABLE CERAMICS
Peter J. Chen 1983 8 p refs Presented at the IUTAM-IUPAP Symp. on the Mech. Behaviour of Electromagnetic Solid Continua, Paris, 4 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-021872; SAND-83-0407C; CONF-830757-1) Avail: NTIS HC A02/MF A01

The responses of ferroelectric ceramics can be quite complex depending on the physical processes to which they are subjected. Their mechanical, electromechanical and dielectric properties depend on domain switching, dipole dynamics and phase transformation. A theory, which describes the responses of these materials, was formulated, and it is sufficient to characterize various observable phenomena. Specifically, a special case of the theory predicts the nature of the butterfly and hysteresis loops. DOE

N83-36241# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
OXYGEN INTERSTITIAL TRANSPORT AND CHEMICAL COLORATION IN SODIUM-BETA ALUMINA
Lutgard C. DeJonghe, Andrew Buechele, and Michel Armand Nov. 1982 20 p refs Presented at the 4th Intern. Conf. on Solid State Ionics, Grenoble, France, 4-8 Jul. 1983
(Contract DE-AC03-76SF-00098)
(DE83-009099; LBL-15308; CONF-830708-1) Avail: NTIS HC A02/MF A01

A reaction rate maximum occurs around 2500C in the bleaching of chemically discolored sodium beta aluminas. It is determined that the bleaching rate depends on the diffusion rate of oxygen interstitials in the conduction planes of sodium beta alumina. The reaction rate maximum indicates that an irreversible transition occurs from a high mobility to a low mobility oxygen interstitial around 3000C. It is proposed that this transition is one in which a free oxygen interstitial is transformed into a Roth-type interstitial. DOE

N83-36242# Sandia Labs., Albuquerque, N. Mex.
THEORY OF DEPHASING OF IMPURITIES IN GLASSES
S. K. Lyo 1983 13 p refs Presented at Conf. on Electron. Excitations and Interaction Processes in Organic Molecular Aggregates, Schlafs Elmau, West Germany, 5 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-015105; SAND-83-1300C; CONF-830677-1) Avail: NTIS HC A02/MF A01

The homogeneous optical linewidth arising from impurity Two Level Systems (TLS) interaction is examined for resonant optical transitions in glasses. A rigorous Green's function approach and a simpler and more intuitive method are found to yield the same result. The width is due to modulation of the optical levels caused by coupling to the diagonal as well as off-diagonal elements of TLS. The main contribution arises from diagonal modulation at low temperatures. In this case a perturbation theory is shown to be inadequate. For diagonal modulation the contribution to the linewidth from a typical weakly coupled (but with vertical bar V/sup z/ vertical bar > K tau(+1)) TLS is larger than that of a strongly coupled TLS and is independent of the coupling strength to the ion: it equals twice the thermal average of the two level-widths of the TLS. Therefore the total linewidth arises dominantly from these abundant but weakly coupled TLS. For a flat density of states of TLS the low temperature linewidth is proportional to T,T(1) (75) and T(2) (2), respectively, for a dipole-dipole, dipole-quadrupole and quadrupole-quadrupole coupling. DOE

N83-36243# Oak Ridge National Lab., Tenn.
ANALYSIS OF THE TEMPERATURE AND STRESS DISTRIBUTIONS IN CERAMIC WINDOW MATERIALS SUBJECTED TO MICROWAVE HEATING
M. K. Ferber, H. D. Kimrey, and P. F. Becher Jul. 1983 53 p refs
(Contract W-7405-eng-26)
(DE83-015747; ORNL/TM-8718) Avail: NTIS HC A04/MF A01

Both edge- and face-cooled windows of either polycrystalline BeO or polycrystalline Al2O3 in microwave gyrotron tubes were analyzed. A computer program was used to determine the electric field distribution within the window at a given power level and frequency. This program was capable of describing both the radial and axial dependence of the electric field. The effects of multiple internal reflections at the various dielectric interfaces were also accounted for. The field distribution was used to derive an expression for the heat generated per unit volume per unit time within the window due to dielectric losses. A generalized heat conduction computer code was then used to compute the temperature distribution based on the heat generation function. The stresses were determined from the temperature profiles using analytical expression or a finite-element computer program. Steady-state temperature and stress profiles were computed for the face-cooled and edge-cooled windows. DOE

N83-36244# Sandia Labs., Albuquerque, N. Mex.
MICROSTRUCTURAL CHARACTERIZATION OF SHOCK-MODIFIED ZIRCONIA POWDERS
J. R. Hellmann, K. Kuroda, A. H. Heuer, and R. A. Graham 1983 4 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983 Prepared in cooperation with Case Western Reserve Univ.
(Contract DE-AC004-76DP-00789)
(DE83-015109; SAND-83-1588C; CONF-830719-3) Avail: NTIS HC A02/MF A01

The internal structure of explosively shocked zirconia powders was examined using transmission electron microscopy. Lower pressure (20 GPa) shocked powders exhibit crystallite size reduction accompanied by extensive deformation. High pressure (27 GPa) shocked specimens exhibit a high degree of deformation as well as localized particle size reduction accompanied by recrystallization to the high temperature tetragonal zirconia polymorph. Recrystallization of heavily deformed monoclinic zirconia particles in both low and high pressure shocked powders could be induced by electron beam heating. Ultrafine (< 30 nm) tetragonal particles in the high pressure shocked powders were resistant to recrystallization during electron beam heating. DOE

N83-36245# SRI International Corp., Menlo Park, Calif.
POLYMER DEGRADATION DURING COMBUSTION Annual Report
S. K. Brauman, D. P. Matzinger, and R. A. Berg May 1983 40 p refs
(Contract NB80-NADA-1003)
(PB83-216333; NBS-GCR-83-428) Avail: NTIS HC A03/MF A01 CSCL 11I

This is an extension of previous work on the degradation of polymers in fire-like conditions. A polymer rod (13.5 mm dia.) is made to gasify linearly at rates equal to those in candle-like burning by replacing the flame with a radiant heat flux. Under these conditions, polystyrene degrades in the same manner as it does in isothermal heating. In the present work, the radiant flux was varied and the resulting steady-state regression rate measured; from the results an effective heat of gasification (472 cal/g) is inferred. Polypropylene was also examined in the present study. In nitrogen its degradation mechanism appears unchanged from that in isothermal heating but in air the situation is less clear as oxygen is found to influence the rate of degradation substantially. DOE

N83-36246# Northwestern Univ., Evanston, Ill.
STRUCTURAL BASIS FOR THE MECHANICAL PROPERTIES OF POLYETHYLENES Annual Report, Dec. 1981 - Nov. 1982
S. H. Carr, B. Crist, and T. J. Marks May 1983 35 p refs
(PB83-217851; GRI-81/0132) Avail: NTIS HC A03/MF A01 CSCL 11I

The physical properties of polyethylene, the material used in gas transmission pipes, are ultimately determined by the nature of the polymeric molecules in the resin used in pipe manufacture. This relation between molecular structure and properties is based on the morphology formed in the polyethylene by a particular processing history. Model polyethylenes having very narrow molecular weight distributions and well defined levels of short chain branching and long chain branching have been used to quantify the effects of molecular structure on mechanical behavior. GRA

N83-36247# Scientific Process and Research, Inc., Highland Park, N. J.
NEW TECHNIQUE FOR PLASTICS PROCESSING
Imrich Klein and Reuben Klein 16 Feb. 1983 323 p refs
(Grant NSF DAR-78-21356)
(PB83-218941; NSF/ECS-83001) Avail: NTIS HC A14/MF A01 CSCL 11I

The SDS screw, a plastics processing device incorporating a dual, concentrically mounted screw system is discussed. Unmelted plastic is drained from the discharge end of the outer screw and led upstream through the inner screw where melting is completed. Experiments confirm that the melting capacity of the extruder can be substantially increased by the installation of an SDS screw. Screws can therefore be designed much deeper than is customary with a correspondingly higher pumping capacity. Deep screws which pump at higher rates also shear the plastic material less. This effect results in lower melt temperature, higher energy efficiency, and absence of temperature fluctuation. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N83-36248# Ashland Petroleum Co., Ky.
REFINING OF MILITARY JET FUELS FROM SHALE OIL, PART 2, VOLUME 2 (IN SITU SHALE OIL PROCESS DATA) Interim Technical Report, Jun. 1979 - Oct. 1980
H. R. Moore, L. M. Henton, C. A. Johnson, and D. A. Fabry Wright-Patterson AFB, Ohio AFWAL Mar. 1982 287 p 3 Vol.
(Contract F33615-78-C-2080; AF Proj. 2480)
(AD-A129031; AFWAL-TR-81-2056-Vol-2-Pt-2) Avail: NTIS HC A13/MF A01 CSCL 21/4

A complete EXTRACTACRACKING evaluation sequence has been performed for Occidental in situ shale oil. Extensive tests for hydrotreating, catalytic cracking, extraction and product upgrading were successfully performed. Data from these tests are contained in this volume. These tests demonstrate that this oil is an acceptable feedstock for EXTRACTACRACKING. Further, specification JP-4 and JP-8 turbine fuels were produced from these materials and provided to the Air Force. GRA

N83-36249# Ashland Petroleum Co., Ky.
REFINING OF MILITARY JET FUELS FROM SHALE OIL. PART 3: PILOT PLANT SAMPLE PREPARATION Interim Report, Nov. 1979 - Jun. 1981
F. H. Turrill Wright-Patterson AFB, Ohio AFWAL Jul. 1982 101 p
(Contract F33615-78-C-2080; AF Proj. 2480)
(AD-A128722; AFWAL-TR-81-2056-Pt-3) Avail: NTIS HC A06/MF A01 CSCL 21/4

Phase 3 work performed was aimed at confirming final process design estimates proposed in Phase 1 and producing sample lots of turbine fuel for aircraft performance evaluations. Drum quantities of JP-4, JP-8 and Broadrange jet fuel were supplied to AFWAL, along with a gasoline blending component, diesel fuels, and residual fuels for these evaluations. Also, the scaled-up data from Phase 3 operating data were utilized in the Phase 4 Economic Evaluations. GRA

N83-36250# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
CHARCOAL REGENERATION. PART 4: COMPETITIVE ADSORPTION OF TNT AND RDX
Jerome Haberman Jun. 1983 37 p refs
(AD-A130002; AD-E401033; ARLCD-TR-83031) Avail: NTIS HC A03/MF A01 CSCL 19/1

Trinitrotoluene (TNT) and cyclotrimethylenetrinitramine (RDX), pink water, adsorption/solvent desorption cycling of activated carbon (FS300) has been studied as a function of various pretreatments. In agreement with previous studies of TNT and RDX individually, preferential plugging of pores by pretreatments did not improve the solvent regeneration of the FS300. The study of the competitive adsorption of TNT and RDX indicated that, at the higher concentrations, TNT tended to displace RDX from the carbon surface. This is attributed to a lower binding energy of the adsorbed RDX to the surface. In conjunction with water adsorption/desorption isotherms, the characteristics of a carbon with improved cycling properties have been elucidated. These properties are in agreement with those characteristics found in previous studies

and involve a shift to a larger pore volume, increased concentration of pores in the mesopore range and an increased ratio of pore opening to pore body diameters. Another desirable property would be a lower adsorption binding energy for these explosives to the activated carbon. GRA

N83-36251# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
A METHOD TO EVALUATE THE BURNING BEHAVIOR OF SECONDARY EXPLOSIVES: COMPOSITION B
Rodolf W. Velicky Jun. 1983 38 p refs
(DA Proj. 1L1-62603-AH-18)
(AD-A130004; AD-E401035; ARLCD-TR-83030) Avail: NTIS HC A03/MF A01 CSCL 21/2

It is demonstrated in this work that the closed bomb can be used to detect changes in the burning properties of Composition B that are caused by small modifications to its composition. It is shown that, upon ignition, Composition B first burns on the surface as do standard gun propellants. It then undergoes a transition during which the initial physical configuration breaks up into fragments. This produces an increased surface area whose creation rate is determined by the particular additive coated on the Cyclotrimethylenetrinitramine (RDX) particles. There are additives, such as estane, which can slow the surface area creation rate more effectively than does the standard wax used in Composition B. The closed bomb can provide the explosive formulator with a powerful laboratory tool which will allow him to monitor the results of his efforts to reduce the deflagration hazards of explosives. Also, with additional work, this tool can help unravel the deflagration mechanisms associated with energetic materials. GRA

N83-36252# Naval Weapons Center, China Lake, Calif. Research Dept.
A SELECTION CRITERION FOR ASSESSING NEW PROPELLANT BINDERS
Arnold Adicoff Apr. 1983 7 p
(AD-A129656; NWC-TM-5005) Avail: NTIS HC A02/MF A01 CSCL 21/9

A selection criterion, S.C., for evaluating binders for propellants has been developed. This criterion uses an algorithm which includes terms for changes in energy, hazards, mechanical properties, processing, cost, and technical risk. The uniqueness of the method is that it uses measured properties of the new material and compares those properties with those of an existing engineering material of a similar kind. The method may have broader utility than in binder selection because a complementary set of properties and procedures can be used to evaluate other new materials for replacement applications. Author (GRA)

N83-36253# Southwest Research Inst., San Antonio, Tex. Energy System Research Div.
EFFECT OF LOW-PROOF ALCOHOL UTILIZATION TO SUPPLEMENT DIESEL FUEL ON ENGINES LIFE EXPECTANCY: CATERPILLAR 3306 PCI Final Report
W. E. Likos and C. A. Moses Mar. 1983 31 p
(Contract DE-AC19-81BC-10467)
(DE83-006617; DOE/BC-10467/12) Avail: NTIS HC A03/MF A01

The effects of the used of proof ethanol to supplement diesel fuel in a 187-HP diesel engine was evaluated. Performance testing for power and emissions and pre and post inspections of critical components of the engine confirmed that no significant changes occurred to the engine due to the alcohol fueling. It is concluded that alcohol fumigation does not result in serious wear or durability penalties. DOE

N83-36254# Southwest Research Inst., San Antonio, Tex. Energy System Research Div.
EFFECTS OF LOW-PROOF ALCOHOL UTILIZATION TO SUPPLEMENT DIESEL FUEL ON ENGINE LIFE EXPECTANCY: JOHN DEERE 6466T Final Report
W. E. Likos and C. A. Moses Mar. 1983 30 p
(Contract DE-AC19-81BC-10467)
(DE83-006618; DOE/BC-10467/11) Avail: NTIS HC A03/MF A01

The effects of using 160 proof ethanol to supplement diesel fuel in a 157-HP diesel engine was evaluated. Performance testing for power and emissions and pre and post inspections of critical components of the engine confirmed that no significant changes occurred to the engine due to the alcohol fueling. It is concluded that alcohol fumigation, under these conditions, does not result in serious wear of durability penalties. DOE

N83-36255# Naval Research Lab., Washington, D. C. Chemistry Div.
MECHANISMS OF SYNCRUDE/SYNFUEL DEGRADATION Annual Report, 15 Sep. 1981 - 30 Sep. 1982
R. N. Hazlett, J. V. Cooney, and E. J. Beal Jun. 1983 100 p
(Contract DE-AI19-81BC-10525)
(DE83-013819; DOE/BC-10525/4; AR-1) Avail: NTIS HC A05/MF A01

Fuel stability tests were conducted at three temperatures - 43, 65 and 800C - with a wide variety of added nitrogen compounds. Most pyrroles develop copious amounts of total insolubles but pyridines, quinolines, tetrahydroquinolines, pyrazoles, pyrrolidines, piperidines and pyrazines form modest amounts of sediments. A time temperature concentration matrix for sediment formation was developed for 2,5-dimethylpyrrole (DMP). A very regular pattern is found with a first order dependence on DMP concentration and an apparent energy of 12 kcal/mole. It is found that basic extracts from two shale derived fuels, when added to the US Navy Shale-II diesel fuel, develop modest amounts of total insolubles. DOE

N83-36256# Sandia Labs., Albuquerque, N. Mex. Geo Energy Technology Dept.
SYNFUELS TECHNOLOGY PUBLICATIONS AND RELATED REPORTS: A BIBLIOGRAPHY, JANUARY 1978 - DECEMBER 1982
Sandra R. Hudson, ed. May 1983 84 p
(Contract DE-AC04-76DP-00789)
(DE83-011770; SAND-83-0688) Avail: NTIS HC A05/MF A01

Research on synfuels processes emphasizes the chemistry and physics of in situ processes for coal gasification and oil shale, and direct liquefaction processes for coal. Research encompasses modeling, laboratory studies, field testing and diagnostics development. Publications, abstracts and sources documenting the research results for calendar years 1978 through 1982 are listed. DOE

N83-36257# Southeastern Oklahoma State Univ., Durant.
DEVELOPMENT OF CONTINUOUS-VACUUM FERMENTATION/FRACTIONAL DISTILLATION FOR THE SMALL-SCALE PRODUCTION OF HIGH-PROOF ETHANOL Annual Report, 1 Sep. 1981 - 30 Nov. 1982
Jack L. Robinson, John R. Wright, and Li-Ching Chan Mar. 1983 51 p refs
(Contract DE-FG07-81ID-12338)
(DE83-011794; DOE/ID-12338/T1) Avail: NTIS HC A04/MF A01

Continuous vacuum fermentation and continuous vacuum fractional distillation (COVFAD) is an experimental process that was proposed for the small scale production of high proof ethanol. Temperature control methods, feedstock addition in continuous operation rate, system pressure maintenance, and interfacing the fermenter with the distillation unit are considered in the design of a reliable system. The fermenter distillate receiver was interfaced with the vacuum distillation system using an intermediate reservoir and a system of solenoid valves. A microprocessor control system was constructed around a personal computer and was inter aced with the COVFAD System. The operation of the COVFAD System was evaluated with two feedstocks for the production of high proof ethanol. The rate of ethanol productivity attained by this system is significantly lower than expected. It is suggested that additional design refinement will be needed to develop a system that economically produces high proof ethanol. DOE

N83-36258# Chem Systems, Inc., New York, N.Y.
PROCESS DESIGN AND ECONOMICS FOR ETHANOL FROM CORN STOVER VIA DILUTE-ACID HYDROLYSIS: DEVELOPMENT OF A BASE-CASE FLOWSHEET FOR PARAMETRIC ANALYSIS OF ACID HYDROLYSIS PROCESSES
Apr. 1983 136 p Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE83-009108; SERI/STR-231-1745) Avail: NTIS HC A07/MF A01

A flow sheet for a cellulose to ethanol plant utilizing high temperature dilute acid hydrolysis is presented. The process is divided into six sections: pretreatment, hydrolysis, fermentation, purification, carbon dioxide recovery, and heat generation and waste treatment. In the pretreatment section, the raw corn stover undergoes steam explosion, the lignin is extracted by ethanol extraction, and the amorphous five- and six-carbon sugars removed in prehydrolysis. The crystalline cellulose is hydrolyzed in the hydrolysis reactor. The sugar solution from the prehydrolysis and hydrolysis sections is neutralized and fermented to carbon dioxide and ethanol in a train of continuous fermenters. The ethanol is recovered by a distillation process, and the carbon dioxide is cleaned and liquified. The unreacted solids and various waste streams are either burned or sent to the waste pond. Capital and operating costs estimates are developed for the plant, and the total plant cost is estimated to be $236 million. DOE

N83-36259# EnBio, Inc., Fairfield, Calif.
MICROALGAE AS A SOURCE OF LIQUID FUELS Final Technical Report
J. R. Benemann, R. P. Goebel, J. C. Weissman, and D. C. Augenstein 15 May 1982 228 p refs
(Contract DE-AC05-81ER-30014)
(DE83-013562; DOE/ER-30014/T1) Avail: NTIS HC A11/MF A01

A detailed review of published economic analyses of microalgae biomass production revealed wide variations in the published costs. A credible cost estimate required the conceptual engineering design and cost estimating of microalgae to liquid-fuels processes. Two systems were analyzed, shallow (2 to 3") covered ponds and deeper (1 ft) open ponds. The most optimistic costs extrapolated were about $60/barrel. These were based on many optimistic assumptions. The major emphasis should be on demonstrating the basic premises on which this design was based: high productivity and oil content of microalgae strains that can dominate in open ponds and which can be harvested by a simple bioflocculation process. Several specific basic research needs were identified: (1) fundamental of species selection and control in open pond systems; effects of environmental variables on species dominance is of particular interest; (2) mechanisms of algae bioflocculation; (3) photosynthetic pathways and efficiency under conditions of high lipid production; and (4) effects of nonsteady state operating conditions, particularly pH (CO2 availability), on productivity. DOE

N83-36260# Environmental Protection Agency, Ann Arbor, Mich. Emission Control Technology Div.
METHANOL: THE TRANSPORTATION FUEL OF THE FUTURE FOR THE 1983 MIDYEAR REFINING MEETING OF THE API (AMERICAN PETROLEUM INSTITUTE). A GOVERNMENTAL VIEW OF OXYGENATES FOR USE AS MOTOR FUELS AND MOTOR FUEL COMPONENTS
Charles Gray, Jr. 11 May 1983 37 p refs
(PB83-215533) Avail: NTIS HC A03/MF A01 CSCL 21D

The analysis which led the conclusion that methanol is the most promising candidate transportation fuel is presented. Results of completed and ongoing engine/vehicle test programs and the concerns associated with the use of methanol as a transportation fuel are also included. GRA

N83-36261# Joyce (T. J.) Associates, Fairfax, Va.
IDENTIFICATION OF SAFETY RELATED RESEARCH AND DEVELOPMENT NEEDS FOR CNG (COMPRESSED NATURAL GAS) VEHICLE FUEL SYSTEMS Final Report, Dec. 1982 - Mar. 1983
Thomas J. Joyce May 1983 71 p refs Sponsored by Gas Research Inst.
(PB83-217885; GRI-82/0061) Avail: NTIS HC A04/MF A01 CSCL 21D

The principal safety issues which concern compressed natural gas (CNG) suppliers, users and government officials were identified. A prioritized listing of safety related R&D projects which would alleviate the concerns was prepared. The safety concerns were identified by means of a mail survey of equipment suppliers, gas utilities, consumers and government agencies. Further information was obtained through follow-up interviews with respondents. The safety R&D conducted in the past or currently underway was reviewed. Existing and proposed safety regulations were analyzed to identify the R&D needed for the CNG industry to meet the requirements. DOE

N83-36262# Parsons (Ralph M.) Co., Pasadena, Calif.
ECONOMIC AND SYSTEMS ASSESSMENT OF THE CONCEPT OF NEARSHORE KELP FARMING FOR METHANE PRODUCTION Final Report, Jun. 1982 - May 1983
J. J. Brehany Apr. 1983 340 p refs Sponsored by Gas Research Inst.
(PB83-222158; GRI-82/0067) Avail: NTIS HC A15/MF A01 CSCL 21D

The cost of production of pipeline quality methane from the anaerobic digestion of California giant brown kelp, macrocystis was qualified. Utilizing state of the art knowledge and techniques, kelp would be grown in nearshore farms in 20 to 80 ft deep ocean waters of the coast of Southern California. The kelp would be harvested, shredded, and pumped as slurry to a central anaerobic biodigestion plant. The kelp would be digested and the resulting gas refined to essentially pure methane. The residual would be a liquid effluent, which would be returned to sea as a nutrient for the kelp farm. Detailed capital and operating costs are estimated for several sizes of farm and plant and an economic model is developed that is capable of interacting between various system components so it can be used to test the effect of changes or improvements in individual subsystems on the levelized product cost of the total system. GRA

N83-36263# Puerto Rico Univ., Mayaguez.
BAMBOO AS A RENEWABLE ENERGY SOURCE
Alberto E. Molini and Jose G. Irizarry Aug. 1982 21 p Presented at the 1st Pan Am. Congr. on Energy, and 2nd Natl. Conf. on Renewable Energy Technol., San Juan, Puerto Rico, 1-7 Aug. 1982
(PB83-211219) Avail: NTIS HC A02/MF A01 CSCL 21D

Some of the approximately 1000 species of bamboo of some 50 genera, which range from plants the size of field grass to giants 120 ft. high and one ft. in diameter, and which grow from sea level in the tropics to 10,000 ft. mountain slopes, appear to be excellent alternate renewable energy sources. This paper presents the results obtained from a recently initiated research effort on the subject. Author (GRA)

N83-36264# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EMISSIONS AND ENERGY EFFICIENCY CHARACTERISTICS OF METHANOL-FUELED ENGINES AND VEHICLES
Jeff Alson and Thomas M. Baines 14 Oct. 1982 36 p refs Presented at the Inst. of Gas Technol. Nonpetroleum Vehicular Fuels, III, Arlington, Va., 14 Oct. 1982
(PB83-211607) Avail: NTIS HC A03/MF A01 CSCL 21D

The emissions and energy efficiency results from two recent Environmental Protection Agency (EPA) test programs involving engines designed to utilize methanol fuel are summarized. GRA

N83-36063*# Toronto Univ. (Ontario).
SPACE STRUCTURE VIBRATION MODES: HOW MANY EXIST? WHICH ONES ARE IMPORTANT?
Peter C. Hughes *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct.

1 Jul. 1983 p 31-47 refs Sponsored in part by Natural Sciences and Engineering Research Council of Canada (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 22B

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N83-36265# Hokkaido Univ., Sapporo (Japan).
BULLETIN OF THE FACULTY OF ENGINEERING, HOKKAIDO UNIVERSITY, NO. 115
Jul. 1983 99 p refs In ENGLISH and JAPANESE
(ISSN-0385-602X) Avail: NTIS HC A05/MF A01

Several areas of engineering are addressed including optical waveguides, iangmuir probes, orthogonal transformation, Markov chain theory, graphite phase in ferritic cast iron crystal growth, bacterial reduction of the sulfate ion, and heat transfer coefficients in mean skin temperature. For individual titles, see N83-36266 through N83-36275.

N83-36266# Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
MEAN SKIN TEMPERATURE WEIGHTED BY SKIN AREA, HEAT TRANSFER COEFFICIENTS AND THERMAL SENSITIVITY c34
Tohru Mochida *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 1-10 refs (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

Formulas for calculating the mean skin temperature are described by a general form - the sum total of the product of both the regional skin temperature and the weighting factor concerned with the region. The weighting factor in these formulas was classified into five groups from the point of the content and the concrete values were compared. Based on the heat equilibrium between man and his environment, a mean skin temperature formula weighted by skin areas and the heat transfer coefficients was derived. With reference to the thermal sensitivity coefficients given, a new formula, which is weighted by three important factors - the skin area, the heat transfer coefficients and the thermal sensitivity, was proposed. As the result of a comparison run against formulas reported previously, the weighting factors of the skin area heat transfer coefficient formula are similar to those of the Hardy - DuBois formula, and the weighting factors of the formula by the skin area, the heat transfer coefficients and the thermal sensitivity are similar to those of the formula by Nadel et al. Author

N83-36267# Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
CHARACTERISTICS OF WETTEDNESS AND EQUI-SKIN TEMPERATURE LINE IN THE EVAPORATIVE REGULATION REGION c34
Tohru Mochida *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 11-21 refs (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

As a result of the analysis of physiological experimental data, the characteristics of the wettedness were clarified, i.e., the value of the wettedness is not constant but differs in accordance with the environmental humidity even when the skin temperature is the same, and it was shown that the evaporative heat loss from the skin surface is inversely proportional to the wetttedness. Based on the properties of the wetedness observed, a new thermal sensation chart in the evaporative regulation region was proposed as an index for evaluating the warmth or the coldness in the environment. The feature of the present chart is that the locus of the equal skin temperature appears as a curved line on the psychrometric chart and that the wettedness on the equi-skin temperature line is not constant but takes varying values. The curved equal skin temperature line means that the influence of the environmental humidity on thermal sensation becomes smaller as the humidity of the environmental humidity on thermal sensation becomes smaller as the humidity of the environment is lowered. Author

N83-36268# Hokkaido Univ., Sapporo (Japan).
FUNDAMENTAL STUDIES FOR TREATMENT OF SULFATE BY MICROORGANISM. OPTIMUM CONDITION FOR BACTERIAL REDUCTION OF SULFATE ION IN SINGLE STAGE CONTINUOUS TREATMENT c51
Akihiko Okamura, Hiroshi Morita, Masao Tsurui, and Takakatsu Takamori *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 23-34 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
(Rept-1) Avail: NTIS HC A05/MF A01

Treatment of gypsum by sulfate-reducing bacteria with continuous culture was studied, and the following results were obtained. (1) The amount of reduced sulfate at a pH in the range of pH 5.7 to pH 6.8 could be expressed in terms of HCl demand for pH-stat. (2) Arrhenius' plot could be adapted to the relationship between the maximum specific titration rate of 1 N HCl and temperature. (3) The maximum growth rate obtained was 0.211 (1/hr) under the conditions of 30 C and pH 6.8 with batch culture. The optimum condition for reduction of sulfate ion with single stage continuous culture was as follows; temperature: 30 C, pH: 6.8 and mean residence time: 8.1(hr). And the reduction rate of sulfate ion was 1.0 (mmol/1-hr) under the optimum condition. (4) Model parameters were determined from experimental data with batch and continuous culture, and the simulation results were in good agreement with the experimental data. Author

N83-36269# Hokkaido Univ., Sapporo (Japan).
CHANGES OF GRAPHITE PHASE IN GROWN FERRITIC S.G. CAST IRON c26
Makoto Soma and Kingo Nagaoka *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 35-46 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

The microstructural changes of graphite is attributed to the irreversible migration of graphite brought about by during heating and cooling. Doubtlessly it is difficult to explain a linear growth of more than 10% by a simple expansion of cast iron due to the graphitization of the limited amount of pearlite. Cast iron preferritized completely by annealing was repeatedly heated between 950 C and 600 C in vacuum with the condition of no growth by the graphitization of pearlite or carbide and changes of graphite phase were analyzed with the quantitative metallography to prove the irreversible migration of graphite followed by growth. The total number of graphite particles increased and the ratio of the number of small sized graphite below 10 microns increased and furthermore the small sized graphite was enlarged gradually by cyclic heatings. The shape of the frequency distribution curve of graphite changed from the type with two peaks to the continuous J-type curve. The above results clarify the validity of the theory of the irreversible graphite migration and elucidate the relation between the graphitization phenomenon and the growth. Author

N83-36270# Hokkaido Univ., Sapporo (Japan).
AN ANALYSIS OF A PRT 2-BERTH STATION MODEL BY THE MARKOV CHAIN THEORY c65
Takashi Nakamura, Masahito Kurihara, and Ijuo Kaji *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 47-58 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

An off-line station with two berths in personal rapid transit systems (PRT) modeled as a discrete time Markov chain is presented. By using a flow graph modification, expressions are given for the distribution of the first passage time from each state to the state subset which corresponds to the event that a vehicle enters a station. In the case where the time of getting on and off

a vehicle is fixed, an expression is then obtained for the distribution of the reccurence time of the state subset. The expression corresponds to the distribution of the interval times of entrances. The mean interval time of entrances is calculated and some numerical results are presented. Furthermore, the difference between two berths and one berth is discussed. Author

N83-36271# Hokkaido Univ., Sapporo (Japan).
AUTOMATIC DETECTION OF CHROMINANCE DISTORTION BY THE Y-C SEPARATE METHOD **c32**
Shingo Oguma and Yoshihiko Ogawa *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 59-64 In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

Experiments were conducted using the 12.5T modulated sine-squared pulse generator, regarding the automatic detection of chrominance distortion by the Y-C separate method. The results of the experiments show that the frame memory for the automatic detection of chrominance distortion by digitizing the Y-C separate method can be used. Accordingly, in a TV station chrominance distortion is detected without using a employing new expensive system. Author

N83-36272# Hokkaido Univ., Sapporo (Japan).
QUANTIZED IMAGE RESTORATION CONSIDERING THE CORRELATION BETWEEN PIXELS **c61**
Nobuyuki Okamoto, Hideo Kitajima, Tetsuo Shimono, and Yoshihiko Ogawa *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 65-72 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

A conversion of continuous signals into digital signals is performed by two operations of sampling and quantizing. The original signals are reconstructed by interpolating the transmitted or memorized digital signals. In rough quantization, however, the quantization noise can not be neglected since the quantized value differs seriously from the sampled value. The monochromatic images are treated by the two dimensional stochastic process. The restoration methods of the sampled signals from the quantized values based on the minimization of the mean squared errors are described. Author

N83-36273# Hokkaido Univ., Sapporo (Japan).
OPTO-DIGITAL HYBRID PROCESSOR OF ORTHOGONAL TRANSFORM **c60**
Tetsuo Shimono, Hideo Kitajima, and Yoshihiko Ogawa *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 73-79 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

A feasibility study of opto-digital hybrid processor of orthogonal transform is presented. It is well known that orthogonal transform coding of the digital signal is one of the most efficient ways to reduce the redundancy of the signal. The orthogonal transform is accomplished by the multiplication of the transform matrix and the data vector, and realization of high speed vector-matrix multiplier is needed to implement the orthogonal transform coder. An optical vector-matrix multiplier using incoherent optics is considered. The input data is presented on a linear light emission diodes (LEDs) array. Guiding these data parallely to a two dimensional optical transparency which describes the orthogonal transform matrix, and projecting the passing light through the optical transparency on a linear photodiodes (PDs) array, the vector-matrix multiplication is accomplished. Furthermore, to improve the flexibility of the processor, a digitally controlled system based on microprocessor is considered. Author

N83-36274# Hokkaido Univ., Sapporo (Japan).
QUICK MEASUREMENT OF PLASMA BY LANGMUIR PROBE **c75**
Fumiyuki Fujita, Ken Nakajima, and Hatsuo Yamazaki *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 81-88 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

A quick measurement and data processing system was developed for Langmuir probes. The system is available for measurement of a plasma which contaminates the probe surface rapidly. This system consists of an ion bombardment circuit for cleaning the probe surface, a sweep circuit (a millisecond and longer), fast A/D converter with IC memory, and a personal computer. The system was used for the measurement of electron temperature and density of a negative glow plasma, produced by abnormal glow discharge. In this plasma, the effect of probe contamination is neglected within a few seconds after the stop of ion bombardment. Author

N83-36275# Hokkaido Univ., Sapporo (Japan).
REFRACTIVE INDEX PROFILE AND ITS GUIDED MODE CHARACTERISTICS OF ION-EXCHANGED PLANAR OPTICAL WAVEGUIDES **c74**
Norihisa Haneda, Masaaki Imai, and Yoshihiro Ohtsuka *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 89-100 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

The refractive index profile and the propagation characteristics of guided beam mode for planar optical waveguides fabricated with ion exchange from molten salts of silver nitrate are discussed. The pyrex glass substrate was dipped into an AgNO3 melt for a typical 3 to 9 hours at 300 C of diffusion temperature; some alkali ions are exchanged by Ag(+) ions forming a high index at the surface. The index profiles are determined by the inverse W.K.B. method based on mode spectroscopy and shown to be exponentially decreasing from the surface. The mode functions are obtained by solving the wave equation for an exponential profile and shown graphically in order to have some understanding of the mechanism producing a scattering loss. The attenuation of the sample waveguides fabricated is also measured and yields a beam loss of 2.0 to 2.5 dB/cm for TE sub 0 mode excitation. Measurements of mode conversion, mode and thickness dependent losses of the waveguide are discussed in detail. These results allow identification of the loss mechanism which depends on either the surface roughness or silver ion concentration in an ion exchanged planar optical waveguide. Author

N83-36276*# Applied Cryogenics and Materials Consultants, New Castle, Del.
LATEST DEVELOPMENTS IN CRYOGENIC SAFETY
T. J. Webster Mar. 1983 15 p refs Presented at 9th Intern. Cryog. Engr. Conf. (ICEC9), Kobe, Japan, 11-14 May 1982
(NASA Order L-44921-B)
(NASA-CR-166087; NAS 1.26:166087) Avail: NTIS HC A02/MF A01 CSCL 13B

The Cryogenic Safety Manual, sponsored by the British Cryogenics Council, was published over 10 years ago. A new updated version is now available. Some general aspects of cryogenic safety are highlighted, and attention is drawn to some of the more unusual hazardous situations. An awareness of the physical properties of the cryogenic fluids being dealt with is important in directing attention to hazardous situations which may arise. Because of this, the more important properties of the cryogenic fluids are given, such as molecular weight, boiling point and freezing point. From these properties, hazardous situations can be deduced. There are hidden dangers that are not always easy to spot. Some of the unexpected hazards, most of which have led to deaths, are: asphyxiation (anoxia), frost bites and hypothermia, explosions, and combustion. The aim of this publication is to help bring about increased safety in the production and use of cryogenic products through a deeper appreciation of the scientific, technological and administrative steps which must be made if accidents, some fatal, are to be voided in the future. Author

N83-36277# California Univ., Livermore. Lawrence Livermore Lab.

TOWARDS A SYSTEMATIC FORMAT FOR (SEISMIC) EQUIPMENT QUALIFICATION STANDARDS
Paul D. Smith 9 Nov. 1982 18 p ref Presented at the ASME Pressure Vessel and Piping Conf., Portland, Ore., 19 Jun. 1983
(Contract W-7405-eng-48)
(DE83-002056; UCRL-86230; CONF-830607-8) Avail: NTIS HC A02/MF A01

As part of technical assistance to the US Nuclear Regulatory Commission, a systematic format for seismic equipment qualification (EQ) was initiated. This format consists of thirty issues associated with seismic EQ. Each issue was considered as a Category of Possible Seismic EQ Requirements and Criteria. That is, seismic EQ standards might be (but presently are not formulated in terms of requirements and criteria that address each of the thirty issues. Each of the thirty issues was ranked and a minimum set identified. The current requirements in existing NRC and national standards were also evaluated against this common set of issues, and they were estimated to score 60 out of 100 overall. It is believed that the systematic format exhibited can be of assistance in obtaining a broader and more complete perspective on seismic EQ issues. This format (but especially the technique) may also be of interest in non-seismic EQ since many of the issues are common. DOE

N83-36278# Sandia Labs., Albuquerque, N. Mex.
EFFECTS OF CURING AND AGING ON THE TRIAXIAL PROPERTIES OF CONCRETE IN UNDERGROUND STRUCTURES
M. M. Hightower 1983 4 p refs Presented at the Symp. on the Interaction of Non-Nucl. Munitions with Structures, Colorado Springs, 10 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-007276; SAND-82-2470C; CONF-830519-1) Avail: NTIS HC A02/MF A01

To accurately predict the response of a concrete structure for a given loading condition some knowledge of shear strength and compressibility is required. Several studies have shown that these properties vary as concrete cures and ages; therefore, the response of a concrete structure changes with time. In order to address this problem, Sandia initiated a material-test program to study the curing and aging of underground concrete structures. Material properties were obtained from cores taken periodically from two underground concrete structures constructed at the Sandia Tonopah Test Range, Nevada. Results of this continuing study are presented. DOE

N83-36279# National Academy of Public Administration, Washington, D. C. Numerical Data Advisory Board.
RESEARCH CONCERNING METROLOGY AND FUNDAMENTAL CONSTANTS Final Report
1983 50 p refs
(Contract NB82-SBCA-1715)
(PB83-204248) Avail: NTIS HC A03/MF A01 CSCL 14B

The important role of fundamental constants and precision measurements in science is discussed and a requirement for increased and continuing support of this field is identified. Precise knowledge of fundamental constants and techniques for making more accurate and reliable measurements are required to test basic theories, to extend our knowledge of the universe, and for practical applications of fundamental theories. It is demonstrated by example that research in this field has led to profound advances that have had an impact on much of our technology-based society. GRA

N83-36280# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ENERGY AND COST EVALUATION OF SOLAR WINDOW FILM USE IN AN OFFICE BUILDING Final Technical Note
S. Treado, J. Barnett, and T. Kusuda Mar. 1983 130 p refs
(PB83-214692; NBS-TN-1174) Avail: NTIS HC A07/MF A01 CSCL 13M

The impact of solar window film utilization on building HVAC system loads, energy consumption and costs, is examined for a typical office building. The evaluation includes characterization and measurement of important film properties, performance of single-glaxing window systems with and without film, simulation of annual building energy performance using the DOE-2 computer program, and a life-cycle cost analysis. Six window film options are compared to clear glass performance for seven climatic regions throughout the United States. Author (GRA)

N83-36281# National Bureau of Standards, Washington, D.C. National Engineering Lab.
WIND LOADING AND STRENGTH OF CLADDING GLASS Final Building Science Series
D. A. Reed and E. Simiu May 1983 52 p refs
(PB83-214189; NBS-BSS-154; LC-83-600515) Avail: NTIS HC A04/MF A01 CSCL 13M

A procedure for investigating glass cladding behavior under arbitrary loads, including fluctuating wind loads, is presented. The procedure accounts for the fact that internal stresses are nonlinear functions of the external loads, that initial glass strengths are random functions of position and direction, and that glass strength undergoes degradation under the action of external loads in accordance with basic fracture mechanics laws. Numerical examples are presented, and corresponding probability distribution curves are calculated, indicating the probability of failure of a specified panel subjected to fluctuating wind loads and to 1-minute constant loads. These curves are used to illustrate a method for assessing current glass cladding design procedures. Author (GRA)

N83-36282# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
SEISMIC DESIGN RESPONSE BY AN ALTERNATIVE SRSS (SQUARE ROOT OF THE SUM OF THE SQUARES) RULE
Mahendra P. Singh and K. B. Mehta Mar. 1983 48 p refs
(Grant NSF PFR-80-23978)
(PB83-216606; VPI-E-83-12) Avail: NTIS HC A03/MF A01 CSCL 13M

The square root of the sum of of the squares (SRSS) procedures are often used to obtain seismic design response. The design inputs for such procedures are usually defined in terms of psuedo velocity or acceleration response spectra. Erroneous results can be obtained with these existing SRSS procedures, especially in the calculation of response where high frequency effects dominate. An alternative SRSS procedure is developed using the so-called mode acceleration approach of structural dynamics. The design input in this procedure is defined in terms of primarily relative acceleration spectra but also relative velocity spectra. The relative spectra can be related to pseudo spectra. For a given number of modes to be used in the analysis, the SRSS rule proposed will predict a more accurate response value than the rules which use psuedo spectra as input, for systems with or without dominant high frequency mode effects. GRA

N83-36283# Council for Mineral Technology, Randburg (South Africa). Measurement and Control Div.
ARC MONITORING ON A 100 kVA EXPERIMENTAL FURNACE
Myles Sinclair Rennie 28 Feb. 1983 17 p refs
(PB83-207019; MINTEK-M83; ISBN-0-86999-617-7) Avail: NTIS HC A02/MF A01 CSCL 13A

A three phase arc furnace with inclined electrodes and gas injection through the electrodes was commissioned by the melting and smelting of a variety of materials. The furnace is equipped with extensive measuring and control instrumentation and facilities for data capture and analysis. The effects of different materials, rates of feeding, temperature, and gas injection on the arcing characteristics were studied. Simple and theory adequately describes some of the phenemona observed, and the spectral decomposition of the voltage waveform provides additional information. The application of these results to smelting processes is discussed. GRA

N83-36284# Insights West, Inc., Los Angeles, Calif.
SOLAR/GAS INDUSTRIAL PROCESS HEAT ASSESSMENT Final Report, Jan. - Dec. 1982
David W. Kearney Dec. 1982 261 p refs Sponsored by Gas

Research Inst.
(PB83-217869; GRI-81/0123) Avail: NTIS HC A12/MF A01 CSCL 13A

An assessment was conducted of solar/gas industrial process heat systems, including consideration of market applications, the status and cost of applicable solar technologies, potential technical barriers to the efficient interfacing of solar with conventional gas fired equipment, and a detailed evaluation comparing solar/gas systems to competing options. GRA

N83-36285# Bureau of Mines, Boulder City, Nev. Engineering Lab.
CORROSION-RESISTANT SULFUR CONCRETES Report of Investigations, 1983
William C. McBee, Thomas A. Sullivan, and Bing W. Jong Apr. 1983 35 p refs
(PB83-214338; BM-RI-8758) Avail: NTIS HC A03/MF A01 CSCL 13C

Sulfur concretes have been developed by the Bureau of Mines as construction materials with physical and mechanical properties that suit them for use in acid and salt corrosive environments where conventional concretes fail. Mixture design methods were established for preparing sulfur concretes using different types of aggregates and recently developed mixed-modified sulfur cements. Bench-scale testing of the sulfur concretes has shown their potential value. Corrosion resistance, strength, and durability of sulfur concrete are superior to those of conventional materials. Field in situ evaluation tests of the sulfur concretes as replacement for conventional concrete materials are in progress in corrosive areas of 24 commercial chemical, fertilizer, and metallurgical plants. Author (GRA)

N83-36286# SRI International Corp., Menlo Park, Calif. Robotics Dept.
MACHINE INTELLIGENCE RESEARCH APPLIED TO INDUSTRIAL AUTOMATION Report, 1 Jan. - 31 Dec. 1982
D. Nitzan, R. Bolles, R. Cain, M. Hannah, J. Herson, P. Horaud, J. Kremers, J. Myers, W. Park, S. Reifel et al Jan. 1983 157 p refs
(Grant NSF DAR-80-23130; SRI Proj. 2996)
(PB83-207548; NSF/MEA-83004; Rept-12) Avail: NTIS HC A08/MF A01 CSCL 13H

Research into advanced automation is discussed. Five principal topics are covered: (1) two dimensional curve segmentation; (2) projector-camera range sensing of three dimensional data; (3) a system for recognition and location of three dimensional parts; (4) modular programmable assembly; and (5) enhancements to robot programming systems (RPS). An algorithm for segmenting a two dimensional curve into straight line segments and circular arcs is presented. The algorithm is applied to silhouette boundaries of industrial parts and to images of their interactions with the plane of light of a projector-camera range sensor. Procedures for calibrating the camera and the light plane are provided and a conceptual system for recognizing and locating three dimensional parts in range data is proposed. GRA

N83-36287# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
MAXIMUM RESPONSE OF NONPROPORTIONALLY AND PROPORTIONALLY DAMPED STRUCTURAL SYSTEMS UNDER MULTICOMPONENT EARTHQUAKES
Mahendra P. Singh and Mohsen Ghafory-Ashtiany Mar. 1983 80 p refs
(Grant NSF PFR-80-23978)
(PB83-216598; VPI-E-83-13) Avail: NTIS HC A05/MF A01 CSCL 13M

Earthquake motions as felt by structures along three orthogonal directions are, in general, statistically correlated. The effect of this correlation on structural response was studied. Assuming the existence of principal axes of excitation along which the components of motion are uncorrelated, the mean square and design response are obtained in terms of spectral characteristics of the uncorrelated components. These responses depend upon the relative orientation of the structure with respect to the principal excitation components. For each response quantity, there exists a set of three orthogonal direction along which if principal excitations are applied, they will cause a maximum response. Identification of these directions is necessary to obtain the worst case response for design purposes. A methodology to obtain such a maximum response of a quantity of design interest is outlined. GRA

N83-36288# Transportation Research Board, Washington, D.C.
HYDROLOGY AND HYDRAULICS: WATER, NOISE AND AIR QUALITY
Scott A. Brown 1982 82 p refs
(PB83-205815; TRB/TRR-896; ISBN--309-03508-2; LC-83-8111; ISSN-0361-1981) Avail: NTIS HC A05/MF A01; HC also Avail. from Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C., 20418 CSCL 13B

The 12 papers deal with the following areas: prediction of channel bed grade changes at highway stream crossing; stream channel grade changes and their effects on highway crossing; assessment of commonly used methods of estimating flood frequency; magnitude and frequency of urban floods in the United States; comparison of prediction methods for soil erosion from highway construction sites; drainage control through vegetation and soil management; effects of dredged highway construction on water quality in a Louisiana wetland. GRA

N83-36289# Transportation Research Board, Washington, D.C.
LEACHATES: TERRAIN ANALYSIS
G. Fred Lee 1982 90 p refs
(PB83-205823; TRB/TRR-892; ISBN-0-309-03504-X; LC-83-8246; ISSN-0361-1981) Avail: NTIS HC A05/MF A01; HC also avail. from Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C., 20418 CSCL 13B

The 13 papers in this report deal with the following areas: Part 1: leachates from excavations and fills; evaluation of potential water quality problems associated with highway excavation and fill; quality of seepage and leachate from mine and mill wastes and control of its effects; induced polarization survey of sulfide bearing rocks in eastern Tennessee and western North Carolina; survey of techniques used for predicting leachate quality; identification of source materials for acid leachates in Maryland coastal plain; leachates from excavations and fills; summation. Part 2: terrain analysis for transportation systems; terrain evaluation for highway planning and design. GRA

N83-36290# Minnesota Dept. of Transportation, St. Paul.
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT INVENTORY
Andrew D. Halverson and Mark G. Hagen Sep. 1982 27 p
(PB83-207274; INVESTIGATION-200; FHWA/MN-RD-82-05) Avail: NTIS HC A03/MF A01 CSCL 13B

A typical concrete pavement has expansion and contraction joints across and along the pavement surface. The joints allow the pavement to change in dimension with changes in temperature. A continuously reinforced concrete pavement (CRCP) does not have expansion or contraction joints. Random, closely spaced cracks are expected to develop naturally and allow for expansion and contraction due to temperature changes. The many random cracks eliminate expensive joint maintenance. This maintenance-free service life feature has not occurred in Minnesota. This CRCP inventory is a physical evaluation of the extent of corrosion on random sections of pavement. It is related to concurrent efforts which will evaluate CRCP rehabilitation techniques. GRA

N83-36291# Kansas Dept. of Transportation, Topeka. Bureau of Materials and Research.
DEMONSTRATION PROJECT NUMBER 39, HOT MIX RECYCLING, GRAY COUNTY, KANSAS Final Report, Jun. 1978 - Nov. 1982
Rodney G. Maag and William H. Parcells, Jr. Jan. 1983 73 p refs Prepared in cooperation with Federal Highway Administration
(Contract DOT-FH-15-280)

(PB83-204313; FHWA-KS-82/3) Avail: NTIS HC A04/MF A01 CSCL 13C

The objective of this demonstration project was to evaluate the hot mix recycling process as a method of renovating a badly cracked and otherwise deteriorated section of road mixed bituminous paving in southwestern Kansas. The equipment used on the project included a cold milling machine to reclaim the upper portion of existing pavement; a drum dryer hot mix plant modified to process the material; and other standard hot mix laydown and compaction machines. Energy consumption comparisons in equivalent gallons of fuel indicate a savings of 17.8% when the recycled method is compared to using all new aggregate. The energy savings is primarily due to less asphaltic cement required and less fuel needed to mill and reuse the existing pavement than to quarry and haul in an equivalent quantity of new aggregate. GRA

N83-36292# Construction Technology Labs., Skokie, Ill.
SEISMIC BEHAVIOR OF LIGHTWEIGHT CONCRETE COLUMNS Final Report
Basile G. Rabbat, James I. Daniel, Thomas L. Weinmann, and Norman W. Hanson Sep. 1982 263 p refs
(Grant NSF PFR-79-02611)
(PB83-204891; NSF/CEE-82045) Avail: NTIS HC A12/MF A01 CSCL 13C

Sixteen full-scale, column-beam assemblies, which represented a portion of a frame subjected to simulated seismic loading, were tested. Controlled test parameters included concrete type, column size, amount of main column steel, size and spacing of column confining hoops, and magnitude of column axial load. The columns were subjected to constant axial load and slow moment reversals at increasing inelastic deformations. Test data showed that properly designed lightweight concrete columns maintained ductility and strength when subjected to large inelastic deformations from load reversals. Confinement requirements for normal weight concrete columns were shown to be applicable to lightweight concrete columns up to thirty percent of the design strength. GRA

N83-36293# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
SUMMARY OF THERMAL PROPERTIES FOR CASTING ALLOYS AND MOLD MATERIALS
R. D. Pehlke, A. Jeyarajan, and H. Wada Dec. 1982 177 p refs
(Grant NSF DAR-78-26171)
(PB83-211003; NSF/MEA-82028) Avail: NTIS HC A09/MF A01 CSCL 13H

A review of thermal properties of casting alloys and mold materials was conducted for the purpose of stimulating activity in computer aided design for castings. A summary of thermal data; thermal conductivity, specific heat, density, and heats of fusion was prepared for metals and casting alloys, and for primary molding materials. This summary represents an initial step in the development of data bases for support of computer aided design systems for castings. Additional information is required, in particular for thermal properties of commercial casting alloy systems. GRA

N83-36294# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
COMPUTER-AIDED DESIGN SYSTEM FOR CASTINGS Progress Report
J. T. Berry Dec. 1982 191 p refs
(Grant NSF DAR-78-24301)
(PB83-212258; NSF/MEA-82019; PR-3) Avail: NTIS HC A09/MF A01 CSCL 13H

Problems associated with the computer aided design of castings are investigated. These problems relate to geometric modeling and physical simulation, the provision of thermal transport data, filling transients associated with the pouring of castings, and the total economics of the computation system itself. Progress towards formulating a model of mold thermal conductivity is reported and the details of a low cost compact method of describing equivalent interfacial heat transfer coefficients which may be derived from the thermal properties of the mold are provided. The mathematical basis for the method is explained in the appendices where an extension of the method is also provided. GRA

N83-36295# Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
SCALE RELATIONSHIPS OF CONCRETE COLUMNS
Richard J. Bedell and Daniel P. Abrams Jan. 1983 142 p refs
(Grants NSF CEE-81-19385; NSF PFR-80-07094)
(PB83-211037; SSR-SER-8302; NSF/CEE-83023) Avail: NTIS HC A07/MF A01 CSCL 13M

The behavior of reinforced concrete columns subjected to shear and axial force reversals were examined and compared to the behavior of small scale models. Two large scale columns were tested with a ratio of shear to axial force equal to 0.25 to simulate the loading on an exterior base story column in a slender multistory building subjected to lateral loads. Loads were applied slowly according to a pattern of reversals representative of what would occur during a strong earthquake motion. In addition, a sustained axial force was applied to each specimen which represented gravity loading. This axial force was varied for the two specimens to examine differences in behavior attributable to inconsistent modeling of gravitational accelerations. With the use of a numerical model, response of the large scale specimens was compared with measured response of small scale (approximately one twelfth scale) models which were tested. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N83-36296 British Broadcasting Corp., London (England). Research Dept., Engineering Div.
THE DESIGN OF THE PROTOTYPE LS 5/9 STUDIO MONITORING LOUDSPEAKER
K. E. Randall and C. D. Mathers Aug. 1983 11 p refs
(BBC-RD-1983/10; PH-245) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

The prototype of a new medium-power studio monitor is described which is physically small enough to be accommodated in areas where a large high-power monitor would be inappropriate. The main design and performance features are: (1) a vented cabinet having a volume of 28 liters (1 cubic foot); (2) two drive units; a proprietary 34mm soft-domed high-frequency unit and a BBC-designed 200mm low-frequency unit having a polypropylene diaphragm and a high temperature voice-coil; and (3) a low-level cross-over circuit feeds a 50 watt stereo amplifier which drives the units separately. The cross-over frequency is 2.4 kHz. The axial frequency response is + or - 3 dB from 56 Hz to 15kHz and the maximum sound level is 100 dB(A) at 1m on axis measured in a typical listening room using light music. Author

N83-36297 Kansas Univ., Lawrence.
FADING NOISE AND ITS EFFECTS ON TWO SAR IMAGE APPLICATIONS Ph.D. Thesis
Josephine Abbott Stiles 1982 151 p
Avail: Univ. Microfilms Order No. DA8303914

Inherent in the process of forming a synthetic aperture radar (SAR) image of terrain is the presence of fading noise, which appears as speckle in the resulting picture. The effects of fading noise were quantified for stereo radar height estimation and map matching guidance. While for height estimation fading has a strong, negative influence on accuracy and precision, fading does not render a SAR image useless for map matching. If the method of image comparison used is assumed to be cross-correlation, then two interesting results are obtained. The cross-correlation function as defined by an expected value (ensemble average) is seen to predict the same peak value, no matter whether the images that

are being cross-correlated are noiseless due to the assumption of a multiplicative fading model and signal and noise statistical independence. When cross-correltion peaks are estimated using FFT techniques, it is observed that the fading noise variance affects the variance of the cross-correlation peak. Fading noise effects are compared (as to their deleterious action on the cross-correlation process) to the effects of scene rotations and to scene changes caused by backscatter changes of diffuse scattering regions.
Dissert. Abstr.

N83-36298 Kansas Univ., Lawrence.
INFORMATION ANALYSES AND EXTRACTION TECHNIQUES FOR SYNTHETIC APERTURE RADAR SIGNALS Ph.D. Thesis
Victor Samuel Frost 1982 174 p refs
Avail: Univ. Microfilms Order No. DA8303889

Techniques for extracting information from synthetic aperture radar images are examined. The properties of these images require the development of new models and processing procedures. The models are also needed to define the average information gained (in the classical Shannon sense) about the target from the observed radar image. A definition for radiometric resolution is proposed based on the average information gain and compared to other descriptions of radiometric resolution based on the probability of detection error for separating two targets as a function of system noise and noncoherent averaging. The information theory analysis also shows that the information per image sample is very small, indicating that data extraction procedures must work with many image samples. With this background, a procedure was developed to extract edge features from radar imagery. An adaptive minimum mean square filter for noise reduction/enhancement was also designed and successfully applied to SEASAT-A SAR imagery.
Dissert. Abstr.

N83-36299*# Virginia Univ., Charlottesville. Dept. of Electrical Engineering.
ADVANCED DIGITAL MODULATION: COMMUNICATION TECHNIQUES AND MONOLITHIC GaAs TECHNOLOGY
S. G. Wilson, J. D. Oliver, Jr., R. C. Kot, and C. R. Richards Jul. 1983 94 p refs
(Grant NAG3-316)
(NASA-CR-174452; NAS 1.26:174452; UVA/528219/EE84/101)
Avail: NTIS HC A05/MF A01 CSCL 17B

Communications theory and practice are merged with state-of-the-art technology in IC fabrication, especially monolithic GaAs technology, to examine the general feasibility of a number of advanced technology digital transmission systems. Satellite-channel models with (1) superior throughput, perhaps 2 Gbps; (2) attractive weight and cost; and (3) high RF power and spectrum efficiency are discussed. Transmission techniques possessing reasonably simple architectures capable of monolithic fabrication at high speeds were surveyed. This included a review of amplitude/phase shift keying (APSK) techniques and the continuous-phase-modulation (CPM) methods, of which MSK represents the simplest case.
N.W.

N83-36300*# Virginia Univ., Charlottesville. Communication Systems Lab.
FOUR-DIMENSIONAL MODULATION AND CODING: AN ALTERNATE TO FREQUENCY-REUSE Final Report
S. G. Wilson and H. A. Sleeper Sep. 1983 60 p refs
(Grant NAG3-141)
(NASA-CR-174453; NAS 1.26:174453; UVA/528200/EE83/107)
Avail: NTIS HC A04/MF A01 CSCL 20N

Four dimensional modulation as a means of improving communication efficiency on the band-limited Gaussian channel, with the four dimensions of signal space constituted by phase orthogonal carriers (cos omega sub c t and sin omega sub c t) simultaneously on space orthogonal electromagnetic waves are discussed. 'Frequency reuse' techniques use such polarization orthogonality to reuse the same frequency slot, but the modulation is not treated as four dimensional, rather a product of two-d modulations, e.g., QPSK. It is well known that, higher dimensionality signalling affords possible improvements in the power bandwidth sense. Four-D modulations based upon subsets of lattice-packings in four-D, which afford simplification of encoding and decoding are described. Sets of up to 1024 signals are constructed in four-D, providing a (Nyquist) spectral efficiency of up to 10 bps/Hz. Energy gains over the reuse technique are in the one to three dB range t equal bandwidth.
S.L.

N83-36301*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
MODELING OF MICROWAVE SCATTERING FROM VEGETATED COVERED TERRAIN Final Report
Roger H. Lang Jun. 1982 116 p refs
(Contract NAG5-83)
(NASA-CR-170590; NAS 1.26:170590) Avail: NTIS HC A06/MF A01 CSCL 20N

General formulation of resonant backscattering from vegetation, mean field and Green's function in three media, and electromagnetic backscattering coefficients from a layer of vegetation are discussed.
N.W.

N83-36302*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK: A RADIO COMMUNICATIONS INSTRUMENT FOR DEEP SPACE EXPLORATION
N. A. Renzetti, C. T. Stelzried, G. K. Noreen, S. D. Slobin, S. M. Petty, D. L. Trowbridge, H. Donnelly, P. W. Kinman, J. W. Armstrong, N. A. Burow et al 15 Jul. 1983 178 p refs
(NASA-CR-174461; JPL-Pub-82-104; NAS 1.26:174461) Avail: NTIS HC A09/MF A01 CSCL 17B

The primary purpose of the Deep Space Network (DSN) is to serve as a communications instrument for deep space exploration, providing communications between the spacecraft and the ground facilities. The uplink communications channel provides instructions or commands to the spacecraft. The downlink communications channel provides command verification and spacecraft engineering and science instrument payload data. For individual titles, see N83-36303 through N83-36311.

N83-36303*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SYSTEM VIEW
G. K. Noreen and C. T. Stelzried *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 25 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Analysis of spacecraft to ground communications link performance and a description of the Deep Space Network system is provided. Due to the tremendous distances involved in communicating between the spacecraft at the edge of our solar system and Earth, communications link performance is stretched to the limit of theoretical predictions. This is required in order to return the maximum amount of data possible during critical events such as planetary flybys. The link analysis provides a basis for the initial link design before spacecraft launch and performance prediction and monitoring during spacecraft flight. Additionally, it indicates what performance upgrades are required for mission extensions and new missions. Performance is improved through the use of a larger antenna collecting area, greater transmitter power, lower receiving system noise temperature and more sophisticated data coding schemes. The performance of the Deep Space Station configuration which serves as the ground portion of the communications link is assessed.
Author

N83-36304*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTENNAS
S. D. Slobin *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 23 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Reception of the exceedingly small signals from spacecraft typical of deep space communication requires antennas of enormous size, complexity, and precision. The two Voyager

spacecraft each have 20-watt X-band transmitters; and at their Saturn encounter distances from Earth of approximately 1.5 billion kilometers, the power density received on the Earth was less than 10 to the minus 19th power watts per square meters. The thrust in deep-space communications improvement was in the areas of ground and spacecraft antenna size and performance increases, spacecraft transmitter power increase, ground receiving system design, and telemetry information coding. Ground antenna theory, design, and performance as related to the particular problem of receiving spacecraft signals using the Deep Space Network (DSN) is described. Author

N83-36305*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LOW NOISE AMPLIFIERS **c33**
S. M. Petty and D. L. Trowbridge *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 32 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

One of the great technical challenges facing the Deep Space Network is receiving signals from a severely weight limited spacecraft hundreds of thousands to billions of kilometers from Earth. This weight limitation has always imposed strict limitations on the size of the spacecraft antenna and the amount of transmitter power radiated. The communication burden is placed upon the ground systems of the Deep Space Network which must recover an extremely weak signal in the presence of nearly overwhelming amounts of noise. Two key parameters that determine the signal to noise ratio of a received signal using a deep space station are the collecting area and efficiency of the antenna, and the amount of noise which is generated in, as well as allowed to enter in, the antenna-mounted receiver. These parameters are used to describe the relative ability of a deep space station to receive weak signals. As spacecraft to Earth communication distances have increased, the Deep Space Network engages in a relentless effort to increase the figure of merit through larger and more efficient antennas, higher frequencies, and lower system noise temperature. Author

N83-36306*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RECEIVERS **c33**
H. Donnelly *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 26 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

Before discussing Deep Space Network receivers, a brief description of the functions of receivers and how they interface with other elements of the Network is presented. Different types of receivers are used in the Network for various purposes. The principal receiver type is used for telemetry and tracking. This receiver provides the capability, with other elements of the Network, to track the space probe utilizing Doppler and range measurements, and to receive telemetry, including both scientific data from the onboard experiments and engineering data pertaining to the health of the probe. Another type of receiver is used for radio science applications. This receiver measures phase perturbations on the carrier signal to obtain information on the composition of solar and planetary atmospheres and interplanetary space. A third type of receiver utilizes very long baseline interferometry (VLBI) techniques for both radio science and spacecraft navigation data. Only the telemetry receiver is described in detail in this document. The integration of the Receiver-Exciter subsystem with other portions of the Deep Space Network is described. Author

N83-36307*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TELEMETRY MODULATION AND COPING **c17**
P. W. Kinman *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 12 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 09F

Digital telemetry has supplanted analog telemetry for deep space communications. With digital telemetry, the telecommunications systems design engineer may use error correcting codes. This allows increased error protection at the cost of increased bandwidth. All science telemetry returned from the Voyager and Galileo spacecraft are protected by error correcting codes. Both the modulation and coding of digital telemetry for the deep space channel are considered. The descriptions include relative performance of some competing schemes. However, the treatment given here is, of necessity, cursory. A small class of modulation schemes has proven to be best for the deep space channel. The digital telemetry is either phase-shift-keyed onto a squarewave subcarrier and then phase modulated onto the carrier or the digital telemetry is directly phase modulated onto the carrier. Author

N83-36308*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PLASMA EFFECTS **c75**
J. W. Armstrong *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 15 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 17I

Radio communication with space probes requires sending signals through the Earth's ionosphere and usually the solar wind. During planetary flybys, the signal may also pass through the ionosphere of another planet. These ionized media can perturb the radio signal in a variety of ways. Examples of these perturbations are variations in the electrical length between the spacecraft and the ground station, Faraday rotation of linearly polarized signals, amplitude and phase scintillations, and spectral and angular broadening. These plasma effects can have undesirable influences on telemetry performance and thus need to be understood from a communications engineering viewpoint. The plasma effects are, however, useful from a scientific viewpoint, since the effects on the communications link can often be inverted to estimate the physical conditions in the plasma. Author

N83-36309*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ATMOSPHERIC EFFECTS
C. T. Stelzried and S. D. Slobin *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 18 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

The Earth's atmosphere consists mostly of the dry components oxygen (about 21% by volume), nitrogen (about 78% by volume) argon (about 1% by volume), and wet components (water vapor, clouds and rain). Water vapor at 100% relative humidity is approximately 1.7% by volume assuming the U.S. Standard Atmosphere, 15 C, at sea level. A communications link through the atmosphere suffers attenuation from both the dry and wet components. This results in a decreased signal to noise ratio (SNR) of the communications link due to both the signal attenuation and the increased noise temperature resulting from thermal emission. Author

N83-36310*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMMAND
N. A. Burow and M. K. Tam *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 24 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The Command System provides the means by which a project controls the activities of its spacecraft from the Earth. An overveiw of the Multimission Command (MMC) System is presented. The major components within the MMC System are discussed, with emphasis on the telecommunications related implementations. Two versions of the spacecraft command detection system the Viking Heritage command detector and the NASA standard command detector are summarized. The former prevails in the existing flight projects and the latter will likely be adopted by the missions of the near future. The preparation of Design Control Tables for the control of command link performance between Deep Space Stations and the spacecraft is also discussed. Author

N83-36311*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEW DIRECTIONS: 1982 - 2000
N. A. Renzetti, J. W. Layland, C. T. Stelzried, and A. L. Berman *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 21 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The major objective of the Deep Space Network in the period 1983-2000 is the fulfillment of the extremely diverse telecommunications requirements of the known and anticipated users. Deep space exploration projects will continue to occupy a dominant role, although in the mid-1980s, with the completion of the Networks Consolidation Program, high Earth orbiter projects will become substantial users of the Network. Also playing an increasingly important role in the Network of the next decade will be non-flight projects, such as Geodynamics, Radio Astronomy, Radar Astronomy, and the Search for Extraterrestrial Intelligence (SETI). The major challenge in meeting the primary Network objective of the next decade will be that of providing increased performance as required by users at costs which can be borne by NASA in an environment of limited resources. Emphasis will be on increased commonality, flexibility, and automation to reduce maintenance and operations costs, and lower mission costs. Author

N83-36312# Sperry Research Center, Sudbury, Mass.
POLARIZATION NULL CHARACTERISTICS OF SIMPLE TARGETS Final Technical Report, 26 Aug. 1981 - 25 Aug. 1982
H. Mieras, R. M. Barnes, G. M. Vachula, J. N. Buchnam, C. L. Bennett, and Wolfgang M. Boerner Griffiss AFB, N.Y. RADC Jan. 1983 254 p refs
(Contract F30602-81-C-0254)
(AD-A129303; RADC-TR-82-335; SRC-CR-82-33) Avail: NTIS HC A12/MF A01 CSCL 17/9

The polarization null and maximum characteristics of simple compound targets are studied; with the objective of assessing the applicability of these concepts to target discrimination. The polarization characteristics of single scattering centers are derived in theoretical detail and shown to be highly distinctive according to scattering center type. However, the dynamic behavior of the characteristics with changing aspect for compound targets is shown to be very complex. It is concluded that these concepts are not generally useful for target discriminations if an extended target is viewed at a single frequency. Extension are suggested to make the approach useful. Author

N83-36313# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE PERFORMANCE OF AN ISOLATED WORD RECOGNIZER USING NOISY SPEECH
Gary Neben 13 Apr. 1983 56 p refs
(Contract F19628-80-C-0002; AF Proj. 7820)
(AD-A128983; TR-647; ESD-TR-83-007) Avail: NTIS HC A04/MF A01 CSCL 05/7

This report investigates the effects of noise on a speaker dependent, isolated work recognition system. Correct word recognition in a noise-free environment exists in a variety of present-day applications. However, when the acoustic environment includes noise, the problem of correct word recognition becomes more difficult. The noise interferes with the accurate location of the work boundaries and also distorts the spectral representation of the speech waveform. A series of experiments were performed to determine (1) the effects of using an energy-based endpoint detector and a conventional isolated word recognition system when the input speech is noisy and (2) the effects of placing a noise suppression prefilter in tandem with the word recognizer in an attempt to remove the noise prior to recognition. It was found that the system consisting of the prefilter working in tandem with the word recognizer increased word recognition accuracy. GRA

N83-36314# Mission Research Corp., Santa Barbara, Calif.
SYNTHESIS OF SEM-DERIVED EQUIVALENT CIRCUITS FOR ENERGY-COLLECTING STRUCTURES Final Report
Kryzstof A. Michalski and L. Wilson Pearson Kirtland AFB, N. Mex. AFWL Apr. 1983 304 p refs Prepared in cooperation with Mississippi Univ., University
(Contract F29601-78-C-0082; AF Proj. 3763)
(AD-A128704; AFWL-TR-82-38) Avail: NTIS HC A14/MF A01 CSCL 20/3

A systematic approach is developed for the synthesis of physically realizable equivalent circuits for antennas and scatterers with definable ports from their SEM (Singularity Expansion Method) description. The necessary SEM information includes the complex natural resonances (or 'poles') of the structure and the associated modal currents ('natural modes') and normalization coefficients. From the poles and natural modes one can compute the coupling coefficients, which weight the given singularity's contribution to the response for a given incident field. The synthesis is performed as a superposition of circuit modules associated with conjugate pairs of poles. This approach leads to simple circuits for which explicit expressions for the element values in terms of the SEM parameters can be given. The entire equivalent network can be divided into two parts -- an immittance part describing the driving-point properties of the structure, and a source part describing its energy-collecting properties. The immittance part is intrinsic to the structure and is independent of the incident field. The source part, however, depends on the direction of arrival of the impinging plane wave and is driven by an automatic voltage source with the waveform corresponding to the time history of incident field. The developed equivalent circuit synthesis procedures are tested on a thin-wire loop and dipole antennas and on a spherical antenna. Results are presented showing good agreement between the SEM equivalent circuits' responses and responses obtained by other means. Author (GRA)

N83-36315# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
TRYING FOR SPEAKER INDEPENDENCE IN THE USE OF SPEAKER DEPENDENT VOICE RECOGNITION EQUIPMENT
Gary K. Poock, Norman D. Schwalm, B. Jay Martin, and Ellen F. Roland Dec. 1982 39 p refs
(AD-A129938; NPS55-82-032) Avail: NTIS HC A03/MF A01

The results of an experiment to determine the possibilities of obtaining some speaker independence using speaker dependent voice recognition equipment is discussed. The results revealed about 99% accuracy when the user's speech templates were in memory along with those of four other users. If the user's voice patterns were not in memory but those of the four other users still were in memory, recognition accuracy still hovered around 95%. Author

N83-36316# Kansas Univ., Lawrence. Remote Sensing Lab.
RADAR BACKSCATTER CROSS-SECTIONS AND ICE CHARACTERIZATION FOR MAY 1977 POINT BARROW EXPERIMENT Final Data Report
R. G. Onstott and R. K. Moore Feb. 1983 84 p
(Contract N00014-76-C-1105)
(AD-A130042; CRINC/RSL-TR-331-27) Avail: NTIS HC A05/MF A01 CSCL 20/14

Radar backscatter measurements were made of shorefast sea ice and fresh water ice near Point Barrow, Alaska, in May 1977 with a transportable microwave spectrometer, TRAMAS, that swept from 1-2 GHz and 8-18 GHz, viewed angles from 10 to 70 deg from nadir, and had antenna transmit-receive polarizations of vertical-vertical, horizontal-horizontal, vertical-horizontal, and horizontal-vertical. Thick first-year sea ice, multiyear sea ice, a small first-year pressure-ridge, and fresh water lake ice were investigated. Included herein are the radar backscatter cross-sections and ice characterization data. Author (GRA)

N83-36317# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
TWO-DIMENSIONAL SIGNAL PROCESSING AND STORAGE AND THEORY AND APPLICATIONS OF ELECTROMAGNETIC MEASUREMENTS Annual Report, 1 Apr. 1982 - 31 Mar. 1983
R. W. Schafer and D. T. Paris Jun. 1983 23 p

(Contract DAAG29-81-K-0024)
(AD-A130104) Avail: NTIS HC A02/MF A01 CSCL 09/2

This annual report covers these specific topics: digital signal processing, parallel processing architectures, two-dimensional optical storage and processing, hybrid optical/digital signal processing, electromagnetic measurements in the time domain, and automatic radiation measurements for near-field and far-field transformations. GRA

N83-36318# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
ELECTRON BEAM-INDUCED ELECTROMAGNETIC WAVES IN A MAGNETOSPHERIC PLASMA
D. E. Donatelli and T. S. Chang Hanscom AFB, Mass. Air Force Geophysics Lab. 15 May 1983 22 p refs
(Contract F19628-81-K-0032; AF Proj. 2311)
(AD-A130116; SCIENTIFIC-1; AFGL-TR-83-0085) Avail: NTIS HC A02/MF A01 CSCL 20/7

A theoretical interpretation of waves detected by the SCATHA satellite near geostationary altitude during electron beam operations is presented. The observations consist of emission bands at or between harmonics of the electron gyrofrequency, combining background and beam-induced emissions. Beam-induced emissions often broaden and/or intensify the emission band. A magnetic field component is detected along with the electric field component for most of the emissions. Therefore, these emissions are assumed to be electromagnetic waves. The linearized Vlasov equation is used to derive the dispersion relation for electromagnetic waves in a warm, homogeneous, uniformly magnetized plasma. The ambient plasma is represented as a Maxwellian distribution and the electron beam as a delta-function in velocity space. The dispersion relations is solved analytically for non-resonant, perpendicularly propagating, electromagnetic waves. Using observational data to quantitatively define the plasma parameters, unstable solutions are found at frequencies consistent with those of the observed emissions. Author (GRA)

N83-36319# Signatron, Inc., Lexington, Mass.
HF MODEM TEST AND EVALUATION Final Technical Report
Lynn K. Cosell, Stephen R. Kolek, Peter Monsen, and Linda C. Perry Griffiss AFB, N.Y. RADC Jan. 1983 55 p refs
(Contract F30602-80-C-0296)
(AD-A130129; A294-11; RADC-TR-83-19) Avail: NTIS HC A04/MF A01 CSCL 17/2

The objective of this program was to evaluate a recently developed, bandwidth efficient, Decision-Feedback Equalizer 'Fast DFE' serial modem for radio communications in the High Frequency (3-30 MHz) radio band. The experimental model of the modem is realized on an AP-120B array processor. Tests of nonfading, flat and frequency selective fading were performed using a separate AP-120B array processor as the channel simulator. Successful performance of the modem operating at 2900 bps in a 2.7 KHz bandwidth was demonstrated on channels with 2 sigma fade rates up to 1 Hz and multipath delay values up to 5 milliseconds. Under slow fading conditions a significant implicit gain due to the multipath is realized. In a comparison with parallel tone modems, the Fast DFE modem significantly outperformed the USC-10, ACQ-6, and MX-190 modems in all test cases. Results reported here show considerable promise of the Fast DFE configuration and there is every indication that the preliminary design implementation which was tested can be further optimized for superior performance. Author (GRA)

N83-36320# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
VOICE RECOGNITION ACCURACY: WHAT IS ACCEPTABLE
G. K. Poock and E. F. Roland Nov. 1982 54 p refs
(Contract MIPR-TB-024)
(AD-A129930; NPS55-82-030) Avail: NTIS HC A04/MF A01 CSCL 17/2

A research experiment was conducted to investigate how accurate a voice recognition system must be for daily production use. Specifically, the purpose of the research was to establish the percentage accuracy level at which a user becomes frustrated and decides not to use a voice recognition device. The experiment consisted of controlling the perceived recognition accuracy of a voice recognition system and then collecting data through the use of a questionnaire from the experimental users on the acceptability of the equipment. The experiment was not totally successful for a variety of reasons. This paper will discuss the research methodology, review the data collected, and suggest possible alternatives to the experimental design to overcome the problem areas encountered. Author (GRA)

N83-36321# Ohio State Univ., Columbus. Electroscience Lab.
DEPENDENCE OF ADAPTIVE ARRAY PERFORMANCE ON CONVENTIONAL ARRAY DESIGN Interim Report, Aug. 1980 - Aug. 1981
Inder J. Gupta and A. A. Ksienski Griffiss AFB, N.Y. RADC Feb. 1983 30 p refs
(Contract F30602-79-C-0068; AF Proj. 4519)
(AD-A130173; ESL-711679; RADC-TR-83-28) Avail: NTIS HC A03/MF A01 CSCL 17/4

A direct relationship between conventional array design and the array performance in an adaptive mode is given. It is shown that the basic goals of conventional array design such as low sidelobes and narrow beamwidth have a direct effect on the adaptive array performance and should not be ignored. An expression is obtained showing that the output signal-to-interference-plus-noise ratio (SINR) of an adaptive array is related to the conventional pattern of the array. The above relations are illustrated for both linear and nonlinear arrays. GRA

N83-36322# Dayton Univ., Ohio.
ATMC (ADVANCED TECHNOLOGY - MULTI-MEDIA COMMUNICATIONS), THE MULTI-MEDIA TELECONFERENCING SYSTEM Final Report
Clifford J. Hoffman and William A. McKinney Jun. 1983 13 p Presented at the 7th Intern. Conf. on Teleconf. and Interactive Media, Madison, Wisc., 1983
(Contract F33615-81-C-0005; AF Proj. 9983)
(AD-A129850; AFHRL-TR-83-26) Avail: NTIS HC A02/MF A01 CSCL 17/2

The ATMC (Advanced Technology - Multi-media Communications), teleconferencing systems being developed by the University of Dayton Research Institute (UDRI) under the sponsorship of the U.S. Air Force Human Resources Laboratory is designed to provide quality real-time teleconferencing over the switched telephone network. Color business graphics, freeze-frame video, cursor pointing, electronic handwriting, and data communications are integrated into a single highly modularized system to provide superior quality presentation support. Author (GRA)

N83-36323# Sanders Associates, Inc., Nashua, N. H. Electromagnetic Compatibility Dept.
ELECTROMAGNETIC COMPATIBILITY (EMC) IN MICROELECTRONICS Final Technical Report
Richard Bossart, John Shekleton, and Brian Lessard Griffiss AFB, N.Y. RADC Feb. 1983 90 p refs
(Contract F30602-80-C-0140; AF Proj. 2338)
(AD-A130404; RADC-TR-83-30) Avail: NTIS HC A05/MF A01 CSCL 09/5

The contents of this report describe a method for assessing electromagnetic compatibility (EMC) of systems which contain microelectronics, i.e. new, complex digital equipments/devices as contracted with typical analog equipments/devices. It provides a basis for defining EMC performance criteria and operation of microelectronics, i.e., new, complex digital equipments/devices as environment. A methodology is established which describes a step-by-step procedure for assessing EMC in microelectronics and for applying the performance criteria. An application of the methodology to a small subsystem is provided to assess the effectiveness of the methodology. There are still many unanswered questions concerning the impact of new microelectronic, integrated circuit, digital, microcircuit technology on EMC. This report represents the first steps taken to determine that impact and to

establish a theoretical basis to provide the necessary technology to ensure EMC. Author (GRA)

N83-36324# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
RECENT PAPERS IN PARAMETRIC MODELLING OF TIME SERIES
Louis L. Scharf, Claude J. Gueguen (Ecole National Superieure des Telecommunications), and Jean-Pierre Dugre Apr. 1983 68 p refs
(Contract N00014-82-K-0300)
(AD-A129781) Avail: NTIS HC A04/MF A01 CSCL 17/2

A variety of topics in signal modelling, parameter estimation, and spectrum analysis are discussed. Throughout, the emphasis is on linear transformations of random data, and the insight this gives into topics as diverse as spectrum analysis, filtering, and modelling. GRA

N83-36325# Navy Personnel Research and Development Center, San Diego, Calif.
IMPLEMENTATION OF MICROFICHE IMAGE TRANSMISSION SYSTEM (MITS): A MULTIFACETED ASSESSMENT OF DEMONSTRATION INSTALLATION Final Report for period ending 1982
John P. Sheposh and Vel N. Hulton Jun. 1983 72 p
(AD-A130562; NPRDC-SR-83-40) Avail: NTIS HC A04/MF A01 CSCL 17/2

A multifaceted approach was employed to evaluate the introduction and implementation of a technological system--the microfiche image transmission system (MITS). Four different aspects of the demonstration installation were investigated: (1) operators' perception of MITS, (2) the requesters' acceptance of the services provided, (3) image quality, and (4) management's evaluation of the MITS implementation. The results revealed that the operators' perceptions of MITS were positive, the requesters regarded MITS as highly satisfactory, the image quality of the facsimile input fiche was judged superior to the MITS output, and the managers and developers regarded the MITS implementation as a success. Issues concerning widespread application of MITS were seen as premature at this time. GRA

N83-36326# Rome Air Development Center, Griffiss AFB, N.Y. Electromagnetic Sciences Div.
PHASE-ONLY NULLING AS A NONLINEAR PROGRAMMING PROBLEM
Robert A. Shore Feb. 1983 20 p refs
(AF Proj. 2305)
(AD-A130552; RADC-TR-83-37) Avail: NTIS HC A02/MF A01 CSCL 09/5

The problem of calculating the minimum phase-only weight perturbations required to impose nulls in the pattern of a linear antenna array is nonlinear and cannot be solved analytically. The problem is, however, an example of nonlinear programming problem and can be solved numerically. This report describes the performance of two nonlinear programming computer codes, LPNLP and VMCON, on the minimized weight perturbation phase-only null synthesis problem. Both codes are effective in general, although convergence problems may be encountered if nulls are required to be imposed at closely spaced locations in high sidelobe regions of the pattern. Author (GRA)

N83-36327# Booz-Allen and Hamilton, Inc., Bethesda, Md.
RELEVANCE OF NATIONAL AND INTERNATIONAL TELECOMMUNICATION STANDARDIZATION ACTIVITIES TO NATIONAL COMMUNICATIONS SYSTEMS OBJECTIVES Final Report
John Gurzick, Bruce Fletcher, and Bruce Strackbein Washington National Communication System Apr. 1983 44 p refs
(Contract DCA100-82-C-0034)
(AD-A130507; NCS-TIB-83-2) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Technical Information Bulletin describes the linkages between the objective of the principal national and international telecommunication standards development organizations and those of the U.S. Government's Federal Telecommunication Standards Program (FTSP). In the process it is shown that the categories of standards to promote interworking of the national telecommunication networks of the various countries of the world, which the ITTCC (International Telegraph and Telephone Consultative Committee) in particular must develop, are the same ones needed to satisfy the interoperability objectives of the FTSP among networks of the various Federal agencies. Finally the point is made that the NCS, in managing the FTSP, must continue to exploit the similarities in objectives by pro-active participation in selected national and international standards development groups. Such participation is necessary to ensure insofar as possible that national and international standards emerging from these organizations are timely and responsiveness to Federal government needs so that the benefits of uniform Federal and national standards may be realized. GRA

N83-36328*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
SHORT-WAVELENGTH ION WAVES UPSTREAM OF THE EARTH'S BOW SHOCK Progress Report
S. A. Fuselier and D. A. Gurnett 2 Jun. 1983 57 p refs Submitted for publication
(Contract NAS5-26829; Grant NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-173088; NAS 1.26:173088; AD-A130489; U-of-IOWA-83-21) Avail: NTIS HC A04/MF A01 CSCL 20C

The identification and explanation of short wavelength antenna interference effects observed in spacecraft plasma wave data have provided an important new method of determining limits on the wavelength, direction of propagation, and Doppler shift of short wavelength electrostatic waves. Using the ISEE-1 wideband electric field data, antenna interference effects have been identified in the ion waves upstream of the Earth's bow shock. This identification implies that wavelengths of the upstream ion waves are shorter than the antenna length. The interference effects also provide new measurements of the direction of propagation of the ion waves. The new measurements show that the wave vectors of the ion waves are not parallel to the interplanetary magnetic field (IMF) as previously reported. The direction of propagation does not appear to be controlled by the IMF. In addition, analysis of the Doppler shift of the short wavelength ion waves has provided a measurement of the dispersion relation. The upper limit on the rest frame frequency was found to be on the order of the ion plasma frequency. At this frequency, the wavelength is on the order of a few times the Debye length. The results of this study now provide strong evidence that the ion waves in the upstream region are Doppler-shifted ion acoustic waves. Author (GRA)

N83-36329# Texas A&M Univ., College Station. Dept. of Electrical Engineering.
SIGNAL DETECTION AND BLOCK TRUNCATION CODING Interim Report, 1 Jan. - 31 Dec. 1982
Don R. Halverson Feb. 1983 12 p refs
(Grant AF-AFOSR-0033-82; AF Proj. 2304)
(AD-A129261; AFOSR-83-0480TR) Avail: NTIS HC A02/MF A01 CSCL 17/2

A number of results were obtained pertaining to signal detection and block truncation coding for image compression. These results led to improved performance over previous approaches, with special attention given to methods which required less statistical knowledge and which were easier to implement. In particular, use of robustness techniques was employed to allow the exploitation of whatever knowledge was available, while retaining insensitivity to the remaining inexactness in knowledge. Author (GRA)

N83-36330# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PHASE RADIO ENGINEERING SYSTEMS
V. B. Pestryakov 28 Apr. 1983 628 p refs Transl. into ENGLISH from the mono. "Fazovyye Radiotekhnicheskiye Sistemy" Moscow, Sovetskoye Radio, 1968 p 42-234 and 273-466
(AD-A129386; FTD-ID(RS)T-0229-83) Avail: NTIS

HC A99/MF A01 CSCL 17/2

The statistical characteristics of the phase of one interference and mixture of interference with the signal is examined. The affect of phase on the optimum detection of signal and characteristics of phase detection, and the methods of the optimum measurement of phase and tracking it are investigated. GRA

N83-36331# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.

A DIGITAL BEAMFORMING ARRAY

J. M. Loomis and J. F. Rose May 1983 100 p refs

(AD-A130015; AD-E950404; DRSMI/RE-83-21-TR) Avail: NTIS HC A05/MF A01 CSCL 17/9

An eight element Digital Beamforming (DBF) array is described. The array has the capability of forming multiple simultaneous beams by converting the RF amplitude and phase of each element to a digital format followed by beamforming in a general purpose computer. The subassemblies necessary at each element for down-conversion and amplification were measured in terms of phase and amplitude matching between elements. Antenna pattern data was gathered and a variety of antenna patterns are presented. Analysis is performed on the patterns to quantify the errors. These errors are compared to the errors measured on the subassemblies to verify the error effects. Author (GRA)

N83-36332# Virginia Univ., Charlottesville. Dept. of Electrical Engineering.

LIMITED SENSING RANDOM MULTIPLE ACCESS USING BINARY FEEDBACK

Lazaros Merakos and Demetrios Kazakos Jan. 1983 47 p refs

(Grant AF-AFOSR-0030-82; AF Proj. 2304)

(AD-A129251; UVA/525634/EE83/109; AFOSR-83-0493TR) Avail: NTIS HC A03/MF A01 CSCL 17/2

The authors consider the random-accessing problem of a single, collision-type, slotted, packet-switched communication channel by a large number of independent, data transmitting bursty users. They propose and analyze an easy-to-implement algorithm under the realistic assumption that each user inspects the channel outcome feedback only whenever he is blocked. Assumed is binary feedback which informs the users only about whether or not there was a collision in the previous slot. It is shown that the algorithm results in finite average delays for transmission at rates less than 0.36 packets per channel slot, and an exact upper bound for the average delay is given. Author (GRA)

N83-36333# Princeton Univ., N. J. Information Sciences and Systems Lab.

ADAPTIVE DETECTION OF A KNOWN SIGNAL IN NON-GAUSSIAN NOISE

Steven V. Czarnecki and John B. Thomas Oct. 1982 11 p refs Presented at the 20th Ann. Allerton Conf. on Commun., Control and Computing, 6-8 Oct. 1982 Submitted for publication

(Contract N00014-81-K-0146)

(AD-A129658) Avail: NTIS HC A02/MF A01 CSCL 17/3

The design of a locally optimal detector for a known signal in non-Gaussian noise is discussed. The optimal detector non-linearity is approximated adaptively in the noise pdf tail region, and a polynomial is used to approximate the non-linearity near the mean. Examples for several different noise environments are presented, showing in these cases that the adaptive detector is able to achieve a high level of performance. GRA

N83-36334# Army Engineer Topographic Labs., Fort Belvoir, Va. Center for Physical Sciences.

RADAR BRIDGE PATTERNS EXTRACTION AND RECOGNITION Progress Research Note, Oct. 1981 - Sep. 1982

Pi-Fuay Chen and Neil D. Fox Apr. 1983 44 p refs

(DA Proj. 4A1-61102-B-52C)

(AD-A129644; ETL-0323) Avail: NTIS HC A03/MF A01 CSCL 17/9

A technique is described for detecting and recognizing various bridge patterns with different orientation angles from a set of radar imagery. The algorithm combines Hough transform, Soble edge operator, image thresholding methods, and decision logics and was implemented as a software for an experimental hardware system consisting of a 32-element by 32-element solid-state array, a minicomputer, and a computer-controlled translational stage. The resolution of bridge orientation angle detection was determined to be approximately 22.5 degrees for the current system setup. This resolution can be improved by enlarging the input measurement array size. Author (GRA)

N83-36335# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.

ANALYTICAL RESEARCH BY COMPUTER SIMULATION OF DEVELOPMENTAL POLARIMETRIC/FREQUENCY AGILE PULSED RADARS

R. F. Russell and F. W. Sedenquist Dec. 1982 118 p refs

(AD-A129502; AD-E950383; DRSMI/RE-83-7-TR) Avail: NTIS HC A06/MF A01 CSCL 17/9

A new generation of radar systems that exploit the polarization characteristics of various targets and clutter are under development. This report examines the methods of simulating these new techniques and presents typical results. Author (GRA)

N83-36336# Naval Research Lab., Washington, D. C. Communications Systems Engineering Branch.

DESIGN OF AUDIO CIRCUITS FOR INPUT-OUTPUT OF DIGITAL VOICE PROCESSORS Final Report

D. C. Coulter 21 Jun. 1983 33 p refs

(AD-A129466; NRL-MR-5100) Avail: NTIS HC A03/MF A01 CSCL 17/2

Good design of input-output audio circuits for mostly digital voice transmission systems, such as the Advanced Narrowband Digital Voice Terminal (ANDVT) may be neglected due to commonly held misconceptions about voice circuits which do not apply here and by a lack of sufficient audio design training of digital engineers. This report details pitfalls and reference sources for this specific design area and also details considerations for design of Automatic Gain Control and Sidetone Circuits. Author (GRA)

N83-36337# SoHaR, Inc., Los Angeles, Calif.

FAULT TOLERANCE, RELIABILITY AND TESTABILITY FOR DISTRIBUTED SYSTEMS Interim Report, Sep. 1981 - Oct. 1982

Herbert Hecht, Myron Hecht, and K. H. Kim Griffiss AFB, N.Y. RADC Feb. 1983 81 p refs

(Contract F30602-81-C-0133; AF Proj. 2338)

(AD-A129438; RADC-TR-83-36) Avail: NTIS HC A05/MF A01 CSCL 17/2

A growing need exists for improved fault tolerance, reliability, and testability in distributed systems which support Command, Control and Communications and Intelligence (C3I) activities. The objective of this study is to provide a foundation for the development of design measures and guidelines for the design of fault tolerant systems. Taxonomies of fault tolerance and distributed systems are developed, and typical Air Force C3I needs in both fault tolerant and distributed computer systems are characterized. Reliability and availability experience for ten typical computer systems is reported in a consistent format, and the data are analyzed from the perspective of a distributed system user. Previous work on the identification of problems in distributed systems and design methods for their solutions is discussed. Key issues in the design of fault tolerant distributed systems are identified. Fault location techniques for specific computer configurations found in C3I applications are described in detail. The study is a continuing effort, and a comprehensive design methodology will be developed based upon the material presented in this report. Author (GRA)

N83-36338# Rome Air Development Center, Griffiss AFB, N.Y.

PROCEEDINGS OF THE ANTENNA APPLICATIONS SYMPOSIUM (1982)

Jan. 1983 686 p refs Symp. held at Urbana, Ill., 22-24 Sep. 1982

(AF Proj. 4600)

(AD-A129356; RADC-TR-82-339) Avail: NTIS HC A99/MF A01

CSCL 09/5

The Proceedings of the 1982 Antenna Applications Symposium is a collection of the State-of-the-Art papers relating to Phased Array Antennas, Millimeter Wave Antennas, Microstrip and Conformal Antennas and Reflector Antennas. Author (GRA)

N83-36339# Mitre Corp., Bedford, Mass.
CONCEPTUAL HARDWARE DESIGN FOR THE DRAMA SERVICE CHANNEL CONTROLLER
D. E. Pauley May 1983 99 p refs
(Contract F19628-82-C-0001; AF Proj. 4920)
(AD-A129346; MTR-8768; ESD-TR-83-133) Avail: NTIS HC A05/MF A01 CSCL 17/2

The need for a survivable, flexible DCS service channel communications network has been established. This report presents a conceptual hardware design for a communications processor that can be used to efficiently control the communications of multiple subsystems using the DRAMA Radio service channel. The cost of a network implemented with the processor is comparable to a less survivable, and less flexible, network implemented with conventional multiplexers and bridges. Author (GRA)

N83-36340# Haskins Labs., New Haven, Conn.
STATUS REPORT ON SPEECH RESEARCH. A REPORT ON THE STATUS AND PROGRESS OF STUDIES OF THE NATURE OF SPEECH, INSTRUMENTATION FOR ITS INVESTIGATION AND PRACTICAL APPLICATIONS Interim Scientific Report, 1 Jan. - 31 Mar. 1983
Michael Studdert-Kennedy and Nancy OBrien 1983 330 p refs
(Contracts N00014-83-C-0083; N01-HD-1-2420; Grants NSF PRF-80-06144; NSF BNS-81-11470; PHS-HD-01994; PHS-HD-16591; PHS-NS-13870; PHS-NS-13617; PHS-NS-18010; NIH-RR-05596)
(AD-A129713; SR-73(1983)) Avail: NTIS HC A15/MF A01 CSCL 06/15

This report is one of a regular series on the status and progress of studies on the nature of speech, instrumentation for its investigation, and practical applications. Manuscripts cover the following topics: The influence of subcategorical mismatches on lexical access; The Serbo-Croatian orthography constraints the reader to a phonologically analytic strategy; Grammatical priming effects between pronouns and inflected verb forms; Misreadings by beginning readers of Serrbo-Croatian; Bi-alphabetism and work recognition; Orthographic and phonemic coding for word identification: Evidence for Hebrew; Stress and vowel duration effects on syllable recognition; Phonetic and auditory trading relations between acoustic cues in speech perception: Further results; Linguistic coding by deaf children in relation beginning reading success; Determinants of spelling ability in deaf and hearing adults: Access to linguistic structures; A dynamical basis for action systems; On the space-time structure of human interlimb coordination; Some acoustic and physiological observations on diphthongs; Relationship between pitch control and vowel articulation; Laryngeal vibrations: A comparison between high-speed filming and glottographic techniques; Compensatory articulation in hearing impaired speakers: A cinefluorographic study; and Review (Pierre Delattre: Studies in comparative phonetics.) Author (GRA)

N83-36341# Columbia Univ., New York.
STUDY OF ALL-MICROPROCESSOR COMPUTER COMMUNICATION NETWORKS Final Report, 16 Aug. 1976 - 31 Mar. 1983
Mischa Schwartz and Theodore Bashkow 27 May 1983 11 p refs
(Contract DAAG29-79-C-0196; Grant DAAG-76-G-0322)
(AD-A129711; ARO-14292.4-EL; ARO-16619.4-EL) Avail: NTIS HC A02/MF A01 CSCL 05/1

The overall problem studied was that of the organization and utilization of very large microprocessor-based computer communication networks. The first phase of this research was directed toward the actual design of microprocessor based communication networks. It was concerned with the manner in which work should be organized and in the internal structure of the physical nodes of the networks. In the second phase it was assumed (given the first phase results) that such distributed networks, containing very large numbers of nodes could indeed be constructed. The focus of attention was now on the problem of routing, and distributed processing in large, possibly dynamically varying networks. Author (GRA)

N83-36342# Utah Univ., Salt Lake City. Dept. of Mathematics.
MATHEMATICAL METHODS IN WAVE PROPAGATION AND SCATTERING THEORY Final Technical Report
Calvin H. Wilcox 13 Jun. 1983 9 p refs
(Contract N00014-76-C-0276; NR Proj. 041-370)
(AD-A129392; REPT-46) Avail: NTIS HC A02/MF A01 CSCL 20/14

Transient wave propagation phenomena are exploited in many branches of engineering and applied science. Examples include pulsed sonar and radar systems, pulsed laser beams and their applications; the use of seismic pulses in geophysical prospecting and ultrasonic pulses in medical imaging. The engineering literature provides an almost unlimited number of other examples. The continuing goal of the research performed under the contracts mentioned above was to develop mathematical methods which would provide both qualitative and quantitative understanding of transient wave propagation and scattering phenomena, with emphasis on acoustic and electromagnetic problems. Author (GRA)

N83-36343# CHI Systems, Inc., Goleta, Calif.
ACOUSTICAL ARRAY PROCESSOR DESIGN Final Technical Report
Glen J. Culler and Micheal McCammon 8 Jun. 1983 59 p
(Contract MDA903-78-C-0313; ARPA Order 3625)
(AD-A129383) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the design of the acoustical array processor known as the CHI-5. The primary goal of the architecture was to provide hardware efficient, yet economical, in implementing linear predictive coding (LPC) algorithms for analysis and synthesis of speech. The CHI-5 can be used with a host processor or it can be used as a voice terminal in a stand alone data driven mode. Author (GRA)

N83-36344# IIT Research Inst., Chicago, Ill.
COMPILATION OF 1982 ANNUAL REPORTS OF THE NAVY ELF (EXTREMELY LOW FREQUENCY) COMMUNICATIONS SYSTEM ECOLOGICAL MONITORING PROGRAM Technical Report, Jul. - Oct. 1982
May 1983 410 p refs
(Contract N00039-81-C-0357)
(AD-A130671; IITRI-E06516-5) Avail: NTIS HC A18/MF A01 CSCL 06/6

A long-term program of studying low-level ELF electromagnetic influences on ecosystems has been initiated in northwestern Wisconsin and the Upper Peninsula of Michigan. Plans are described for studying the terrestrial ecosystem, the aquatic ecosystem and the wetland ecosystem. Selection of study sites, monitoring protocols, and analytical methods were initiated in 1982, and data collection will commence in 1983. GRA

N83-36345# Stanford Linear Accelerator Center, Calif.
EXPERIMENTS WITH VERY-HIGH-POWER RF PULSES AT SLAC
H. A. Hogg, G. A. Loew, and V. G. Price Mar. 1983 4 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-011847; SLAC-Pub-3083; CONF-830311-154) Avail: NTIS HC A02/MF A01

Experiments in which the powers of two SLAC klystrons were combined and fed into a resonant cavity pulse compression system (SLED) are described. Pulse powers up to 65 MW into SLED were reached. The corresponding instantaneous peak power out of SLED was 390 MW. After normal initial aging, no persistent RF breakdown problems were encountered. The X-radiation at the

SLED cavities was generally less than 400 mR/h after aging. The theoretical relationship between X-radiation intensity and RF electric field strength is discussed. DOE

N83-36346# Sandia Labs., Albuquerque, N. Mex. Minicomputer Software Div.
AUTOMATED DEGHOSTING FOR TRILATERATION RADARS
John P. Long Jun. 1983 20 p refs
(Contract DE-AC04-76DP-00789)
(DE83-014464; SAND-82-1467) Avail: NTIS HC A02/MF A01

A means for locating multiple radar targets using a range only radar was devised. Tens of targets may be located every few milliseconds with one radar transmitter and several receivers, in conjunction with a modest minicomputer. The ability to locate targets depends on two original developments which are described: (1) the geometric locations of the radar antennas with respect to one another; and (3) the computer algorithm used to deghost the incoming data. DOE

N83-36347# California Univ., Berkeley. Electronics Research Lab.
OPTICAL COMMUNICATION SYSTEMS: PROCEEDINGS OF THE TENTH ANNIVERSARY MEETING OF THE NATIONAL SCIENCE FOUNDATION GRANTEE-USER GROUP IN OPTICAL COMMUNICATION SYSTEMS
J. R. Whinnery 1982 188 p refs Meeting held in Berkeley, Calif., 2-4 Jun. 1982
(Grant NSF ECS-81-20086)
(PB83-196089; NSF/ECS-82054) Avail: NTIS HC A09/MF A01 CSCL 17B

Papers delivered at the conference are grouped according to the sessions in which they were presented. The sessions covered such topics as integrated optics and millimeter waves; fiber optics and sources; systems and systems theory; short pulse phenomena; and communications technology. The subjects addressed in the papers include optical-waveguide devices for picosecond signal processing, bistable semiconductor lasers, atmospheric optical communications, and high speed fiber optics local networks. The meeting agenda and a list of attendees are provided. GRA

N83-36348# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
METEOR BURST COMMUNICATIONS MARKET
Eldon J. Haakinson Feb. 1983 48 p refs Sponsored in part by Army Communications Command
(PB83-194134; NTIA/REPT-83-116) Avail: NTIS HC A03/MF A01 CSCL 17B

The meteor burst communications model is a user-interactive computer model that predicts the reliability of a communications system that uses meteor bursts as the communications channel. The model predicts the waiting times required to complete the transfer of messages from a master station to a remote station as a function of frequency, transmitter and receiver characteristics, system protocol, distance separation, time of year, and time of day. The model also allows the user to specify a network of stations including the master, remote, and relay stations. Waiting time estimates are computed for the entire network. The model is implemented on a mini-computer operated by the institute for Telecommunication Sciences. Model users remotely access the computer from their own terminals over telephone lines. GRA

N83-36349# International Trade Administration, Washington, D.C.
HIGH TECHNOLOGY INDUSTRIES: PROFILES AND OUTLOOKS. THE TELECOMMUNICATIONS INDUSTRY
1983 77 p
(PB83-211169) Avail: NTIS HC A05/MF A01; also available in set of 4 reports PC E99 CSCL 05C

This profile is designed to: (1) assess the international competitive position of the U.S. Telecommunication Equipment Industry; pin point the major foreign and domestic challenges to American Telecommunication equipment manufacturers; and present for discussion possible options in terms of U.S. government policies affecting the sector's international standing. GRA

N83-36350# Middleton (David), New York.
THRESHOLD SIGNAL RECEPTION IN ELECTROMAGNETIC INTERFERENCE ENVIRONMENTS. PART 3: AN INTRODUCTION TO CANONICAL THRESHOLD SIGNAL AND PARAMETER ESTIMATION
David Middleton Jan. 1983 62 p refs
(Contract COM-OT-124)
(PB83-216275; NTIA-CR-83-21-Pt-3) Avail: NTIS HC A04/MF A01 CSCL 17B

The determination of optimum threshold estimators (and estimates) of signals and their parameters in general is addressed with focus on the critical question of where and how to terminate the (weak signal) series approximations to the exact expression from which the estimators are derived. The demonstration of explicit estimators under these circumstances, for a variety of signal parameters where the noise is nongaussian, usually is also considered. The procedure for obtaining the desired threshold estimators is embedded in the usual Bayes theory. The estimators themselves are locally optimum bayes estimators (LOBE's), just as their detection counterparts are the more familiar locally optimum bayes detectors (LOBO's). GRA

N83-36351# Middleton (David), New York.
THRESHOLD SIGNAL RECEPTION IN ELECTROMAGNETIC INTERFERENCE ENVIRONMENTS. PART 4: AN INITIAL CONCEPTUAL STUDY OF SIGNAL DESIGN AGAINST NON-GAUSSIAN INTERFERENCE
David Middleton Jan. 1983 38 p refs
(Contract COM-OT-124)
(PB83-216283; NTIA-CR-83-22-Pt-4) Avail: NTIS HC A03/MF A01 CSCL 17B

The problem of possible further optimization of the cricital case of weak signal (or threshold) detection by waveform selection, or 'signal design' is examined from a conceptual viewpoint. The basic approach starts with the relevant threshold performance measures and establishes an extremum functional based on the (null hypothesis, (i.e., H)) variance of the optimum processing algorithm with one or more (additive) constraints involving input signal structure. Both discrete and functional variational techniques provide formal solutions, when these exists. In the present cases of independent (i.e., white), noise samples it is the signal dependent structures alone which separately support possible further optimization. GRA

N83-36352# National Telecommunications and Information Administration, Annapolis, Md.
BACKGROUND STUDY ON EFFICIENT USE OF THE 2700-2900 MHz BAND
Robert L. Hinkle Mar. 1983 150 p refs
(PB83-214288; NTIA/REPT-83-117) Avail: NTIS HC A07/MF A01 CSCL 17I

The report on the 2700-2900 MHz band provides background information and summarizes the findings on tasks assigned to the Interdepartment Radio Advisory Committee (IRAC) Technical Subcommittee by the IRAC (IRAC Doc. 21572). Equipment characteristics, radar deployment patterns, usage of the band based on Radio Spectrum Measurement System (RSMS) van measurements, and projected usage of the band in the 1980's are discussed. Also the accommodation of new systems planned for the band was studied. Based on the projected growth in the band and present and projected radar deployment patterns, recommendations were made to the IRAC which would enhance the accommodation of new systems planned for the band.
Author (GRA)

N83-36353# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
ELECTRIC AND MAGNETIC FIELD SENSOR FOR SIMULTANEOUS ELECTROMAGNETIC NEAR-FIELD MEASUREMENTS: THEORY

Motohisa Kanda Apr. 1983 37 p
(PB83-214205; NBS-TN-1062) Avail: NTIS HC A03/MF A01 CSCL 20C

The theory of using a single sensor to perform simultaneous electric and magnetic near-field measurements is described. The theory indicates that it is possible to obtain the magnetic-loop and electric-dipole currents using a loop terminated with identical loads at diametrically opposite points. The theory also indicates that it is possible to obtain an ideal load impedance for achieving equal electric and magnetic field responses of the loop. Preliminary experiments have been performed using plane waves to verify these results. GRA

N83-36354# Office of Science and Technology, Washington, D.C.
REDUCED DOMESTIC SATELLITE ORBITAL SPACINGS AT 4/6 GHz
George L. Sharp May 1983 161 p refs
(PB83-203893; FCC/OST-R83-2) Avail: NTIS HC A08/MF A01 CSCL 17B

The technical basis for satellite orbit spacing intersystem interference is examined. Several complex mathematical analyses of intersystem isolation and signal interactions are reported. As such, this report is addressed to the rather small community of communications engineers that concerns itself with intersystem interference. Compilations of equations, U.S. domestic satellite system characteristics, and signal parameters that are important in interference analysis and system design are included. Also included are two computer programs that implement intersystem interference models. GRA

N83-36070*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROL OF ANTENNA-FEED ATTITUDE AND REFLECTOR VIBRATIONS IN LARGE SPACEBORNE ANTENNAS BY MECHANICAL DECOUPLING AND MOVABLE DAMPERS
P. K. C. Wang, E. C. Hong, and J. S. Sarina *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 143-161 refs Prepared in cooperation with California Univ., Los Angeles (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20N

N83-36072*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROL OF LARGE SPACE ANTENNAS BASED ON ELECTROMAGNETIC-STRUCTURAL MODELS
Massih Hamidi and Farzin Manshadi *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 181-194 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20N

N83-36271# Hokkaido Univ., Sapporo (Japan).
AUTOMATIC DETECTION OF CHROMINANCE DISTORTION BY THE Y-C SEPARATE METHOD
Shingo Oguma and Yoshihiko Ogawa *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 59-64 In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N83-36355* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FOCAL AXIS RESOLVER FOR OFFSET REFLECTOR ANTENNAS Patent
Richard F. Schmidt, inventor (to NASA) Issued 27 Sep. 1983 12 p Filed 2 Oct. 1981 Supersedes N82-10287 (20 - 01, p 0043)
(NASA-Case-GSC-12630-1; US-Patent-4,407,001;
US-Patent-Appl-SN-308009; US-Patent-Class-343-840;
US-Patent-Class-343-100AP) Avail: US Patent and Trademark Office CSCL 09A

Method and apparatus for determining the focal axis of an asymmetrical antenna such as an offset paraboloid reflector whose physical rim is not coincident with the boundary of the electrical aperture but whose focal point is known is provided. A transmitting feed horn array consisting of at least two feed horn elements is positioned asymmetrically on either side of an estimated focal axis which is generally inclined with respect to the boresight axis of the antenna. The feed horn array is aligned with the estimated focal axis so that the phase centers (CP sub 1, CP sub 2) of the two feed horn elements are located on a common line running through the focal point (F) orthogonally with respect to the estimated focal axis.
Official Gazette of the U.S. Patent and Trademark Office

N83-36356* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
AUTOMATIC LEVEL CONTROL CIRCUIT Patent
Pierce C. Toole and Dennis M. McCarthy, inventors (to NASA) Issued 27 Sep. 1983 4 p Filed 17 Jul. 1981 Supersedes N81-29347 (19 - 20, p 2759)
(NASA-Case-KSC-11170-1; US-Patent-4,406,989;
US-Patent-Appl-SN-284288; US-Patent-Class-330-110;
US-Patent-Class-330-282) Avail: US Patent and Trademark Office CSCL 09C

An automatic level control circuit for an operational amplifier for minimizing spikes or instantaneous gain of the amplifier at a low period wherein no signal is received on the input is provided. The apparatus includes a multibranch circuit which is connected between an output terminal and a feedback terminal. A pair of zener diodes are connected back to back in series with a capacitor provided in one of the branches. A pair of voltage dividing resistors are connected in another of the branches and a second capacitor is provided in the remaining branch of controlling the high frequency oscillations of the operational amplifier.
Official Gazette of the U.S. Patent and Trademark Office

N83-36357* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ERROR CORRECTION METHOD AND APPARATUS FOR ELECTRONIC TIMEPIECES Patent
John R. Davidson and Joseph S. Heyman, inventors (to NASA) Issued 4 Oct. 1983 7 p Filed 13 Feb. 1981
(NASA-Case-LAR-12654-1; US-Patent-4,407,589;
US-Patent-Appl-SN-234225; US-Patent-Class-368-201;
US-Patent-Class-368-200; US-Patent-Class-368-184) Avail: US Patent and Trademark Office CSCL 09C

A method and apparatus for correcting errors in an electronic digital timepiece that includes an oscillator which has a 2 in. frequency output, an n-stage frequency divider for reducing the oscillator output frequency to a time keeping frequency, and means for displaying the count of the time keeping frequency. In first and second embodiments of the invention the timepiece is synchronized with a time standard at the beginning of the period of time T. In the first embodiment of the invention the timepiece user observes E (the difference between the time standard and the timepiece time at the end of the period T) and then operates a switch to correct the time of the timepiece and to obtain a count for E. In the second embodiment of the invention, the user operates a switch at the beginning of T and at the end of T and a count for E is obtained electronically.
Official Gazette of the U.S. Patent and Trademark Office

N83-36358*# City Coll. of the City Univ. of New York. Communications Systems Lab.
VLSI TECHNOLOGY AND APPLICATIONS Final Report, 25 Jun. 1982 - 24 Jun. 1983
Donald L. Schilling 1983 90 p refs
(Grant NAG3-299)
(NASA-CR-174451; NAS 1.26:174451) Avail: NTIS HC A05/MF A01 CSCL 09C

Metal oxide semiconductor and GaAs devices are discussed. Digital and analog circuits are described. Applications to communications circuits are presented. Author

N83-36359*# EIC, Inc., Newton, Mass.
MODERATE TEMPERATURE RECHARGEABLE SODIUM BATTERIES Final Report, Oct. 1978 - Jan. 1983
K. M. Abraham, M. W. Rupich, L. Pitts, and J. E. Elliott Jul. 1983 120 p refs
(Contract NAS3-21726)
(NASA-CR-168220; NAS 1.26:168220) Avail: NTIS HC A06/MF A01 CSCL 10C

Cells utilizing the organic electrolyte, NaI in triglyme, operated at approx. 130 C with Na(+) - intercalating cathodes. However, their rate and stability were inadequate. NaAlCl4 was found to be a highly useful electrolyte for cell operation at 165-190 C. Na(+) intercalating chalcogenides reacted with NaAlCl4 during cycling to form stable phases. Thus, VS2 became essentially VS2Cl, with reversible capacity of approx 2.8 e(-)/V, and a mid-discharge voltage of approx 2.5V and > 100 deep discharge cycles were readily achieved. A positive electrode consisting of VCl3 and S plus NaAlCl4 was subjected to deep-discharge cycles > 300 times and it demonstrated identity with the in-situ-formed BSxCly cathode. NiS2 and NiS which are not Na(+)-intercalating structures formed highly reversible electrodes in NaAlCl4. The indicated discharge mechanism implies a theoretical capacity 4e(-)/Ni for NiS2 and 2e(-)/Ni for NiS. The mid-discharge potentials are, respectively, 2.4V and 2.1V. A Na/NiS2 cell cycling at a C/5 rate has exceeded 500 deep discharge cycles with 2.5e(-)/Ni average utilization. A 4 A-hr nominal capacity prototype Na/NiS2 cell was tested at 190 C. It was voluntarily terminated after 80 cycles. Further development, particularly of cathode structure and hardware should produce a battery capable of at least 50-W-hr/lb and more than 1000 cycles. Author

N83-36360# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
CAPACITY TESTS OF LITHIUM/SULFUR DIOXIDE BATTERY CELLS UNDER FLIGHT CONDITIONS
H. F. Bittner, C. C. Badcock, and M. V. Quinzio 30 Sep. 1983 48 p
(Contract F04701-82-C-0083)
(TOR-0083(3429-01)-2) Avail: NTIS HC A03/MF A01

There is concern that long term, low drain discharges imposed on aerospace lithium/sulfur dioxide (Li/SO2) batteries would result in degraded battery capacity. Spacecraft now under development will use two configurations of Li/SO2 batteries fabricated from a common cell design. A group of high rate LiSO2 cells that were identical to those in flight batteries were tested according to projected load profiles. Tests were designed to evaluate the effects of drain rate, time, and temperature. Results indicated that cell capacity degradation occurred at elevated temperatures under long term, low rate discharges; periodic high rate pulsing appeared to mitigate the degradation. Depleted cells were observed to lose voltage and swell upon open circuit stand. Results from these tests are used to predict remaining battery capacity during orbital operations. Author

N83-36361*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS Triannual Report, period ending 31 Jul. 1982
Alexander Garcia, III Nov. 1982 41 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955567)
(NASA-CR-174456; DOE/JPL-955567-82/9; JPL-9950-777; NAS 1.26:174456) Avail: NTIS HC A03/MF A01 CSCL 09C

An analytical methodology for advanced encapsulation designs was developed. From these methods design sensitivities are established for the development of photovoltaic module criteria and the definition of needed research tasks. Analytical models were developed to perform optical, thermal, electrical and analyses on candidate encapsulation systems. From these analyses several candidate systems were selected for qualification testing. Additionally, test specimens of various types are constructed and tested to determine the validity of the analysis methodology developed. Identified deficiencies and/or discrepancies between analytical models and relevant test data are corrected. Prediction capability of analytical models is improved. Encapsulation engineering generalities, principles, and design aids for photovoltaic module designers is generated. S.L.

N83-36362# Aerospace Corp., El Segundo, Calif. Engineering Group.
STATE-OF-THE-ART ASSESSMENT OF TESTING AND TESTABILITY OF CUSTOM LSI/VLSI CIRCUITS. VOLUME 5: DESIGN FOR TESTABILITY Final Report
A. J. Carlan and M. A. Breuer (Breuer and Associates) Oct. 1982 68 p refs 6 Vol.
(Contracts F04701-80-C-0081; F04701-81-C-0082; F04701-82-C-0083)
(AD-A128672; SD-TR-83-20-VOL-5; TR-0083(3902)-1-VOL-5) Avail: NTIS HC A04/MF A01 CSCL 09/5

Designing for testability if needed to reduce costs associated with testing and maintaining electronic systems. Two approaches are considered: (1) modification of established circuits and (2) general design of new circuits where testability is a major consideration. Computer programs TMEAS and SCOAP, developed for evaluating testability in established circuits, are discussed. In the design of new circuits only a few techniques are known that yield highly testable circuits without sacrificing other desirable traits, two, IBM's LSSD method and bit slicing, are discussed.
Author (GRA)

N83-36363# Maryland Univ., College Park. Dept. of Electrical Engineering.
LASER-CONTROLLED MILLIMETER-WAVE SWITCHING, GATING AND PHASE SHIFTING IN DIELECTRIC WAVEGUIDES
Chi H. Lee May 1983 44 p refs Prepared in cooperation with Harry Diamond Labs., Adelphi, Md.
(Contract DAAK21-81-C-0109; HDL Proj. 314132)
(AD-A128727; HDL-CR-83-109-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

The results are summarized of the investigation of a number of millimeter-wave device concepts based on laser-induced solid-state plasma in a semiconducting waveguide. Using the waveguide as a phase shifter, a phase shift up to 1400 degrees/cm has been obtained. Using a Cr-doped GaAs waveguide, a millimeter-wave modulator with a bandwidth greater than 1 GHz has been demonstrated. A complete theoretical analysis has been carried out and a dynamic bridge method has been devised to measure the rapid phase change. Several experiments are suggested for future study. The ultimate goal of this research is to develop a monolithic millimeter-wave integrated circuit technology. The results of this study show that this goal is clearly achievable.
Author (GRA)

N83-36364# Aerospace Corp., El Segundo, Calif. Engineering Group.
STATE-OF-THE-ART ASSESSMENT OF TESTING AND TESTABILITY OF CUSTOM LSI/VLSI CIRCUITS. VOLUME 2: HARDWARE DESIGN VERIFICATION Interim Report
A. J. Carlan and M. A. Breuer (Breuer Associates) Oct. 1982 58 p refs 6 Vol.
(Contracts F04701-80-C-0081; F04701-81-C-0082; F04701-82-C-0083)
(AD-A128692; SD-TR-83-20-VOL-2; TR-0083(3902-04)-1-VOL-2)

Avail: NTIS HC A04/MF A01 CSCL 09/2

The complexity of digital circuits requires that more emphasis be placed on design specifications and verification. Specification of design requirements currently advocated is done with formal hardware descriptive languages (HDLs) to describe hardware function. Industry's current use of HDLs is primarily for simulation. Verifying a design is a less mature discipline. Three approaches are considered: simulation, symbolic simulation amd formal proofs. While symbolic simulation shows promise, much research and development is required. GRA

N83-36365# Northeastern Univ., Boston, Mass. Dept. of Electrical Engineering.

INVESTIGATION OF CHARACTERISTICS AND APPLICATIONS OF NEW CCD SIGNAL PROCESSING DEVICES Final Technical Report

Basil L. Cochrun and John G. Proakis Griffiss AFB, N.Y. RADC Feb. 1983 137 p refs

(Contract F19628-79-C-0165; AF Proj. 4600)

(AD-A128676; RADC-TR-82-322) Avail: NTIS HC A07/MF A01 CSCL 09/3

This final report describes the work on the development of two high-speed sampled analog signal processing modules based on charge coupled device (CCD) technology. A Z-80 microprocessor serves as the controller for the modules. The CCD's used in the modules are an analog-binary correlator (ABC), a programmable transversal filter (PTF), a refreshable sampled analog memory (RSAM), a corner-turning memory (CTM) and a Reticon chirp-z transform device. A description of the devices in contained in the report and a number of possible interconnections are considered. Also described are the software and hardware features in the interface between the CCD modules and the microprocessor and the software that was developed for the Z-80 microprocessor. GRA

N83-36366# Stanford Univ., Calif. Integrated Circuits Lab.

COMPUTER-AIDED DESIGN OF INTEGRATED CIRCUIT FABRICATION PROCESSES FOR VLSI (VERY LARGE SCALE INTEGRATION) DEVICES Semiannual Report, 1 Apr. - 30 Sep. 1982

J. D. Plummer, R. W. Dutton, J. F. Gibbons, C. R. Helms, J. D. Meindl, W. A. Tiller, C. P. Ho, K. C. Saraswat, and B. E. Deal Jun. 1983 101 p refs

(Contract MDA903-79-C-0257; ARPA Order 3709)

(AD-A130105; SU-ICL-17-79; SU-TR-DXG501-82-1; DELET-TR-79-0257-4) Avail: NTIS HC A06/MF A01 CSCL 09/2

Efficient design of high performance VLSI process requires accurate models for the physical processes used for fabrication. This is particularly true as device geometries shrink and fabrication technologies become inherently 2D. First order models for thermal oxidation, ion implantation, diffusion, chemical vapor deposition and other processes cannot accurately predict device structures from modern IC technologies. The fundamental objective of this program is to develop accurate and physically correct models for these processes which are general enough to incorporate in a general purpose, user-oriented computer simulation tool - SUPREM. This program accepts process schedules as inputs and provides predicted device structures as outputs. It is meant to be capable of accurately simulating both bipolar and MOS VLSI structures. SUPREM is specifically designed to couple with device simulation tools so that it forms the cornerstone of a hierarchy of VLSI process, device, circuit and system design aids. Author (GRA)

N83-36367# Wisconsin Univ., Madison. Dept. of Physics.

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF OPTOGALVANIC EFFECTS Annual Technical Report, 30 Jun. 1981 - 29 Sep. 1982

James E. Lawler 24 Nov. 1982 39 p refs

(Grant AF-AFOSR-0208-81; AF Proj. 2301)

(AD-A130111; AFOSR-83-0552TR) Avail: NTIS HC A03/MF A01 CSCL 09/1

Research on the 594.5 nm optogalvanic effect in the Neon positive column discharge was performed. Absolute measurements of the effect per unit of absorbed laser power were performed for discharge radius-pressure products of 9.1 cm-Torr to 1.0 cm-Torr and for substaining direct currents of 1 to 16 mA. The effect was modeled in this regime by applying perturbation theory to key rate equations. The model predictions are in agreement with the experimental measurements. Associated measurements of absolute metastable densities indicate that the studied regime covers the transition from a discharge sustained primarily by single-step electron impact ionization to a discharge sustained primarily by two-step ionization via the 2p53s metastable levels. Author (GRA)

N83-36368# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.

SAW (SURFACE ACOUSTIC WAVE) RESONATOR AND REFLECTIVE ARRAY DEVICES Interim Report, 1 Jul. 1980 - 31 May 1982

J. Herold, J. Thoss, D. Penunuri, and S. Ricca Ft. Monmouth, N. J. Army Electronics and Development Command Dec. 1982 192 p refs

(Contract DAAK20-80-C-0281)

(AD-A129936; DELET-TR-80-0281-1; IR-1) Avail: NTIS HC A09/MF A01 CSCL 09/1

This report documents the engineering effort applied during this Manufacturing Methods and Technology (MM/T) contract on two distinct SAW devices using grooved reflective arrays on two different piezoelectric substrate materials. One device is 60 MHz by 60 microsecond down chirp linearly-dispersive filter operating at 200 MHz using lithium niobate and the second device is a two-part, 100 KHz bandwidth resonator operating at 400 MHz using quartz. The reflective is formed by an ion beam etch process. The degree of time-linearity on the RAC filter was achieved by use of metallic phase correction patterns. With a common pattern, with phase error was reduced to about 18 degrees (RMS); with a second correction pattern designed for each individual RAC, the phase error was further reduced to about 7 degrees (RMS). The corresponding sidelobe levels in the time-domain pulse compression loop using an ideal matched filter were 25 and 32 dB, respectively. Author (GRA)

N83-36369# Michigan State Univ., East Lansing. Dept. of Chemistry.

WIDE DYNAMIC RANGE ARRAY DETECTOR FOR ABSORBANCE AND ROTATION SPECTROMETRY Interim Technical Report

Peter J. Aiello (Merck and Co., Inc., West Point, Pa.) and Christie G. Enke 5 Jul. 1983 29 p refs Submitted for publication Sponsored in part by Abbott Labs., N. Chicago, Ill.

(Contract N00014-76-C-1092)

(AD-A130612; TR-13) Avail: NTIS HC A03/MF A01 CSCL 07/4

Photodiode detectors have a limited dynamic range relative to a photomultiplier tube. Sensitivity (in terms of intensity) can be adjusted by changing the integration time, but the integration time for all diodes in array detector is the same for any given scan, and all portions of a spectrum are acquired within the same limited dynamic range. However, the results of scans taken at varying times can be combined to produce data set with improved dynamic range. A microprocessor-controlled system for the automatic sequencing of detector integration time and the storage of only the optimum readings is described. An improvement in dynamic range of 215 times that for a single integration time is theoretically possible, but in most systems, stray light and dark current will limit the practical dynamic range attainable. Author (GRA)

N83-36370# Naval Research Lab., Washington, D. C.

COUPLED AMPLIFIER MODULE FEED NETWORKS FOR PHASED ARRAY ANTENNAS Interim Report

Richard A. Steinberg 25 May 1983 46 p refs

(RR0210543)

(AD-A129286; NRL-8492) Avail: NTIS HC A03/MF A01 CSCL 09/5

The coupled amplifier module (CAM) lattice is a new type of

feed for phased-array antennas that uses far fewer phase shifters than conventional feeds. For example, the CAM feed network for a linear array employs just one phase-shifter; a 2-D rectangular array requires just three phase-shifters. The CAM feed is realized as a periodic lattice of hard-limited amplifiers. Analysis and computer simulation show that the network establishes a linear phase progression. The CAM network's transient response and sensitivity to fabricational imperfections are also analyzed.
Author (GRA)

N83-36371# GTE Sylvania, Inc., Waltham, Mass. Power Systems Operation.
INVESTIGATION OF LITHIUM THIONYL CHLORIDE BATTERY SAFETY HAZARDS Final Technical Report, Sep. 1981 - Nov. 1982
Robert C. McDonald, Frederick W. Dampier, Paul Wang, and James M. Bennett Jan. 1983 85 p refs
(Contracts N60921-81-C-0229; N60921-81-R-0190; SF65571692) (AD-A129302) Avail: NTIS HC A04/MF A01 CSCL 10/2

The chemistry of discharge and overdischarge in Li/SOCl2 cells has been examined with Raman emission, Fourier transform infrared, and electron spin resonance spectroscopies to determine if any hazardous reactions can occur. Under moderate discharge rate at room temperature, the electrolyte from discharged and cathode limited overdischarged cells contains primarily LiAlCl4.3 SO2, LiAlCl.2 SOCl2, and perhaps LiAlCl4.SOCl2.SO2; traces of SO3 are indicated. Three free radicals are present at low concentrations on discharge and cathode limited overdischarged with two additional radicals appearing on extended anode limited overdischarge. At least one of these is cationic polymeric sulfur. Both FTIR and ESR suggest intermediates exist with lifetimes on the order of days from discharge and overcharge. No hazardous reactions were observed at anytime. Pressure from SO2, a principal result of discharge, remains low due to the LiAlCl4.3 SO2, complex in solution. Scanning electron and optical microscopic investigations lithium dendrite structure. Individual dendrites do not grow any longer than about 50 microns or any thicker that about four microns in diameter before branching at random angles. The extent of dendritic growth and the fate of the dentrites depends on the discharge conditions. No overcharged hazards were encountered in this study though several hazard scenarios suggested themselves. GRA

N83-36372# Boeing Aerospace Co., Seattle, Wash.
HIGH VOLTAGE DESIGN GUIDE. VOLUME 4: AIRCRAFT Final Report, 29 Sep. 1979 - 5 Jan. 1983
W. G. Dunbar Wright-Patterson AFB, Ohio AFWAL Jan. 1983 244 p refs 4 Vol.
(Contract F33615-79-C-2067; AF Proj. 3145)
(AD-A129530; AFWAL-TR-82-2057-VOL-4) Avail: NTIS HC A11/MF A01 CSCL 10/2

This report supplies the theoretical background and design techniques needed by an engineer who is designing electrical insulation for high-voltage, high-power components, equipment, and systems for aircraft. A literature survey and abundant bibliography identify references that provide further data on the subjects of partial discharges, corona, field theory and plotting, voids and processes for applying insulation. Both gaseous and solid insulations are treated. Cryogenic and liquid design notes are included. Tests and test equipment for high voltage insulation and equipment are defined. Requirements of test plans and procedures for high-voltage, high-power equipment are identified and illustrated by examples. Suggestions for high-voltage specifications are provided. Very few of the Military and Government specifications deal with system voltages above 10kV, thus most aircraft high-voltage specifications will have to be derived from the power industry specifications and standards produced by ASTM, IEEE, and NEMA. GRA

N83-36373# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Electrical Engineering and Applied Physics.
BRUSHLESS SUPERCONDUCTING GENERATOR Final Report, Apr. 1979 - Jun. 1982
O. K. Mawardi and Altan M. Ferendeci Jan. 1982 71 p refs
(Contract F33615-79-C-2038; AF Proj. 3145)
(AD-A129699; AFWAL-TR-82-2097) Avail: NTIS HC A04/MF A01 CSCL 10/2

This report covers work on a flux pump excited brushless superconducting alternator. The flux pump, used to provide the excitation current of the field coils incorporates several features of a machine studied theoretically and reported in an earlier paper. The flux pumping is achieved with six electromagnets having pole pieces of special configurations to yield high efficiency and rapid pumping rates. The maximum design values for the current in the pump is 1,300 amps and for the rational speed, 500 rpm. Sensors installed on the generator yield information on the spatial and temporal behavior of the magnetic field in the flux spot and on the operational characteristics of the pump. The preliminary observations are compared with theoretical predictions. GRA

N83-36374# Los Alamos Scientific Lab., N. Mex.
A CIRCUIT MODEL FOR THE EXPLOSIVE-DRIVEN PLATE GENERATOR
R. S. Caird, D. J. Erickson, C. M. Fowler, B. L. Freeman, and J. H. Goforth 1983 31 p refs Presented at Third Intern. Conf. on Magnetic Field Generation and Related Topics 13-17 Jun. 1983, Novosibirsk, USSR Sponsored by DOE
(DE83-011110; LA-UR-83-999; CONF-830606-6) Avail: NTIS HC A03/MF A01

Explosive-driven generators are modelled as lumped parameter circuit elements in order to estimate performance in applications and to optimize the design of experiments. The plate generator is essentially a parallel or tilted plate transmission line in which the current-carrying flat plate conductors are driven by plane wave explosive systems. A simple model for the time-varying inductance of this system was developed. First, an analytic expression is used to predict the plate motion. Then, the inductance is expressed as a function of plate separation to give the computational model. Time-dependent flux losses are accounted for by an increasing waste inductance. Model predictions are compared with the available shot data. DOE

N83-36375# California Univ., Livermore. Lawrence Livermore Lab. EE Technical Publications Group.
ELECTRONIC COMPONENT DOCUMENTATION IN A RESEARCH-LABORATORY ENVIRONMENT
Jack W. Spencer Aug. 1982 4 p Presented at the IEEE Profess. Commun. Soc. Conf., Lynnfield-Wakefield, Mass., 13 Oct. 1982
(Contract W-7405-eng-48)
(DE82-021349; UCRL-88112; CONF-821031-1) Avail: NTIS HC A02/MF A01

Documenting electronic components and assemblies used by design personnel at a scientific research laboratory is a challenge. Documentation must be both up-to-date and complete enough to provide designers the information they need for unusual applications. Yet, because of the relatively small quantities of components used, the documentation must be inexpensive to produce and distribute. Close interaction between technically-knowledgeable editor/writers and components engineers results in components documentation closely tailored to the needs of our design personnel. This paper discusses the philosophy underlying the efforts, as well as the organization, production, and distribution of component documentation. DOE

N83-36376# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
DEVELOPMENT OF A LOAD CELL FOR MECHANICAL TESTING IN HYDROGEN
Laura P. McCabe 1982 10 p refs Presented at the 10th Ann. DOE Compatibility Conf., Albuquerque, N. Mex., 26-29 Oct. 1982
(Contract DE-AC09-76SR-00001)
(DE83-012087; DP-MS-82-53; CONF-821038-9) Avail: NTIS HC A02/MF A01

Many tests on materials to determine hydrogen compatibility are performed on small test samples in pressure vessels where monitoring of actual sample load is difficult. A method was

developed to monitor small samples by placing inside the vessel a miniature load cell which is capable of measuring loads of less than 100 lbs. The load cell monitors load by means of a Wheatstone Bridge circuit composed of four strain gages. Two of the gages are mounted on a stainless steel stub which becomes part of the vessel load string; the others are wired outside the pressure vessel. Previously, load cells have been shortlived because of hydrogen diffusion into the epoxy phenolic adhesive used to attach the strain gages to the stub. The use of a flame sprayed ceramic, however, rather than an organic epoxy to mount the strain gages appears to produce a load cell resistant to the hydrogen test environment. DOE

N83-36377# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.

THE 9.1-T IRON-FREE Nb-Ti DIPOLE MAGNET WITH PANCAKE WINDINGS

W. Gilbert, S. Caspi, W. Hassenzahl, R. Meuser, C. Peters, J. Rechen, R. Schafer, C. Taylor, and R. Wolgast Mar. 1983 6 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983

(Contract DE-AC03-76SF-00098)

(DE83-012470; LBL-15157; CONF-830311-134) Avail: NTIS HC A02/MF A01

An eight-pancake Nb-Ti dipole magnet, with bent up ends, called D-108B has been built and tested. This magnet is a Nb-Ti version of a Nb3Sn magnet designed to produce a 10-tesla dipole field in a 40 mm diameter aperture. The pancake design is used for the heavy 12,000 ampere Nb3Sn cable because of the mechanical difficulty in winding such a heavy cable into the conventional nested cylindrical shell configuration with a 2 inch inner winding diameter. The Nb-Ti version operates at 1.8K, in He II, has superconducting cable half as thick as the Nb3Sn cable, and operates at half the operating current: 6000 A rather than 12,000 A at 10 tesla. Both magnet are approximately one meter long. D-10B was tested from January 26 to February 2, 1983 and reached short-sample performance in both He I and He II after moderate training. The central field at 4.3K is 7.0(+-0.1) tesla, and at 1.8K is 9.1(+-0.2) tesla. Ramp rate sensitivity and cyclic heating data were also measured. DOE

N83-36378# California Univ., Livermore. Lawrence Livermore Lab.

CURRENT STATUS OF THE DEVELOPMENT OF THE REFUELABLE ALUMINUM-AIR BATTERY

J. F. Cooper, K. A. Kraftick, and B. J. McKinley 10 May 1983 8 p refs Presented at the 18th Intersoc. Energy Conversion Conf., Orlando, Fla., 21 Aug. 1983

(Contract W-7405-eng-48)

(DE83-012695; UCRL-89155; CONF-830812-16) Avail: NTIS HC A02/MF A01

The technical status of a refuelable aluminum air battery using flowing caustic aluminate electrolyte at 50 to 700 C is reviewed. Four distinct designs for rapidly refuelable cells were evaluated in single or multicell modules on an engineering scale (167 to 1000 cm(2)/cell). Consideration is given to cells of the wedge configuration, which allow partial recharge, high anode utilization, and rapid refueling. Kinetic models developed for aluminum trihydroxide precipitation are used to predict the behavior of integrated cell/crystallizer systems. Drive cycle life and polarization data are reviewed for air electrodes under simulated vehicle operating conditions. Problems in the development of cost effective anode alloys are described. These results are interpreted from the perspective of the potential of an aluminum air battery to provide an electric vehicle with the range, acceleration and rapid refueling capabilities of common automobiles. DOE

N83-36379# Sandia Labs., Albuquerque, N. Mex.

A 3-MJ CAPACITOR BANK FOR THE SNL ELECTROEXPLOSIVE FACILITY

E. C. Chare and C. B. Dobbie (Maxwell Labs., Inc.) 1983 3 p ref Presented at the IEEE Power Electron. Spec. Conf., Albuquerque, N. Mex., 6 Jun. 1983

(Contract DE-AC04-76DP-00789)

(DE83-013675; SAND-83-0333C; CONF-830621-16) Avail: NTIS HC A02/MF A01

A 3-MJ capacitor bank was added to the Electroexplosive Facility for injecting the initial magnetic energy into large explosive generators. It consists of two 800-(SIGMA)F, modules that are first charged to +60 kV and -60 kV, respectively, and then discharged in series by explosive detonator switches to provide 400 (SIGMA)F at 120 kV. The bank was designed to deliver priming currents up to 2 MA and to have an energy transfer efficiency of 0.7 to 0.84 for generator inductance of approximately 10 (SIGMA)H. Type 17/14 coaxial cable will be used to interconnect the capacitor modules, detonator switches, and load. All generators primed by this bank will be crowbarred at peak current to limit capacitor voltage reversal and extend the life of the capacitors. The major components of the system are described. DOE

N83-36380# Argonne National Lab., Ill.

PROTOTYPE SECTOR MAGNETS FOR THE GeV ELECTRON MICROTRON (GEM)

R. B. Wehrle, J. H. Norem, W. F. Praeg, R. H. Swanstrom, and K. M. Thompson 1983 3 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983

(Contract W-31-109-eng-38)

(DE83-011753; CONF-830311-150) Avail: NTIS HC A02/MF A01

Three prototypes of the sector magnets for GeV Electon Microtron accelerators were designed. One was built and two are under construction. The first is a full scale, 168 ton prototype for one half of a 2 GeV Double Sided Microtron (DSM) sector magnet. It is demonstrated that the required close tolerances for flatness and parallelism can be met. The second magnet is an approximate two thirds scale model of one step at the low energy end of the hexatron sector magnet designed for the 4 GeV Electron Microtron (GEM). The measured fields demonstrate that the field falls off faster than an Enge short tail and error fields are at low levels and are controllable. A third prototype magnet exactly duplicates the full scale geometry of the first three full orbits of the GEM sector magnet from entrance to exit points. It will permit high precision measurements and corrections of field errors and verify the 3-D computer program, TOSCA. DOE

N83-36381# Sandia Labs., Albuquerque, N. Mex.

A RADIATION-HARDENED VLSI TECHNOLOGY

P. V. Dressendorfer, W. R. Dawes, Jr., R. W. Light, and B. D. Shafer 1983 5 p refs Presented at the 20th IEEE Ann. Conf. on Nucl. and Space Radiation, Gatlinburg, Tenn., 18 Jul. 1983

(Contract DE-AC04-76DP-00789)

(DE83-008908; SAND-83-0690C; CONF-830714-1) Avail: NTIS HC A02/MF A01

A 2(SIGMA) m technology for producing LSI and VLSI parts hardened to megarad radiation levels was developed and implemented on a single event upset free 16 K static CMOS RAM. Key process features and technology tradeoffs are discussed. DOE

N83-36382# North Carolina State Univ., Raleigh.

CONSIDERATIONS FOR SINGLE-EVENT IMMUNE VLSI LOGIC

S. E. Diehl, J. E. Vinson, B. D. Shafer (Sandia National Labs.), and T. M. Mnich (Sandia National Labs.) 1983 12 p refs Presented at the 20th IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Gatlinburg, Tenn., 18 Jul. 1983

(Contract DE-AC04-76DP-00789)

(DE83-013992; SAND-83-0731C; CONF-830714-7) Avail: NTIS HC A02/MF A01

The applicability of resistive decoupling and other hardening techniques to circuits and chip level systems at very large scales of integration and at very high signal speeds is considered. Circuits may sustain soft errors due to ion interactions with non-RAM logic. The modes of ion induced error production in nonmemory circuitry are identified and methods of upset reduction or prevention determined to produce single event immune circuit designs. The applicability of hardening methods to logic of smaller size and/or

higher speed is identified. Established computer simulation methods are used to predict limitations for single event immune integrated circuits. The single event problem is defined and characterized at a chip level, and criteria are suggested for optimizing designs for use in ion environments. DOE

N83-36383# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

ELECTRICAL PROPERTIES OF GLASSY CARBON

D. F. Baker and R. H. Bragg Sep. 1982 7 p refs Presented at the Intern. Symp. on Carbon, Toyohashi, Japan, 1-4 Nov. 1982

(Contract DE-AC03-76SF-00098)

(DE83-015283; LBL-14938; CONF-8211103-1) Avail: NTIS HC A02/MF A01

The electrical conductivity, Hall effect, and magnetoresistance of glassy carbon were measured after heat treatments (HTT) at 1000 to 30000 C and in magnetic fields up to 5 Tesla. The conductivity is the sum of three components and follows the equation sigma = A + B exp - CT/sup -1/4/ + delta T. Results indicate there are microstructural changes occurring with HTT. DOE

N83-36384# Sandia Labs., Albuquerque, N. Mex.

SNAP-BACK: A STABLE REGENERATIVE BREAKDOWN MODE OF MOS DEVICES

A. Ochoa, Jr., F. W. Sexton, T. F. Wrobel, G. L. Hash, and R. J. Sokel (INMOS, Colorado Springs, Colo.) 1983 11 p refs Presented at the 20th IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Gatlinburg, Tenn.

(Contract DE-AC04-76DP-00789)

(DE83-013993; SAND-83-0653C; CONF-830714-9) Avail: NTIS HC A02/MF A01

N-channel MOS transistors used in NMOS and in CMOS microelectronic circuits have a drain to source breakdown characteristic showing a negative resistance region. Activating this mode of operation leads to a drop in source to drain voltage and to a large drain current. Snap back is not a four layer (SCR, latch up) phenomenon, but, like latch up, can be initiated by current injection into the p-well, by avalanching junctions or by exposure to ionizing radiation. The sustaining voltage can be significantly below the drain substrate avalanche voltage thereby limiting the maximum operating voltage. A qualitative model for snap back local conductivity modulation occurs in the intrinsic base region of the parasitic bipolar transistor leading to regenerative feedback is presented. Effects of process variations on the snap back characteristics are presented as are triggering sensitivities to ionizing radiation. DOE

N83-36385# Sandia Labs., Albuquerque, N. Mex.

ZINC-BROMINE BATTERIES FOR BULK ENERGY STORAGE

R. J. Bellows, C. Elspass, H. Einstein, P. Grimes, E. Kantner, P. Malachesky, and K. Newby 1983 17 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21 Aug. 1983

(Contract DE-AC04-76DP-00789)

(DE83-010822; SAND-83-7083; CONF-830812-3-Draft) Avail: NTIS HC A02/MF A01

The design, testing, operation, and state of development of zinc-bromine batteries are discussed. DOE

N83-36386# California Univ., Livermore. Lawrence Livermore Lab.

ALTERNATIVE CONNECTIONS FOR THE LARGE MFTF-B SOLENOIDS

Earle W. Owen, Daniel W. Shimer, and S. T. Wang 20 May 1983 77 p refs

(Contract W-7405-eng-48)

(DE83-015191; UCID-19808) Avail: NTIS HC A05/MF A01

The MFTF-B central-cell solenoids are a set of twelve closely coupled, large superconducting magnets with similar but not exactly equal currents. Alternative methods of connecting them to their power supplies and dump resistors are investigated. The circuits are evaluated for operating conditions and fault conditions. The factors considered are the voltage to ground during a dump, short circuits, open circuits, quenches, and failure of the protection system to detect a quench. Of particular interest are the current induced in coils that remain superconducting when one or more coils quench. The alternative connections include separate power supplies, combined power supplies, individual dump resistors, series dump resistors and combinations of these. A new circuit that contains coupling resistors is proposed. The coupling resistors do not affect normal fast dumps but reduce the peak induced currents while also reducing the energy rating of the dump resistors. Another novel circuit, the series circuit with diodes, is discussed in detail. DOE

N83-36387# California Univ., Livermore. Lawrence Livermore Lab.

AVALANCHE DEVICES STATE-OF-THE-ART

Michael D. Pocha 1983 11 p Presented at the ARO Workshop on Solid State Switches for Pulsed Power, Tamarron, Colo, 12 Jan. 1983

(Contract W-7405-eng-48)

(DE83-014841; UCRL-88536; CONF-830145-1) Avail: NTIS HC A02/MF A01

Some uses and characteristics of avalanche transistors are briefly listed, and some observations derived from studying avalanche transistors are given, as well as plans for future work. It is found that surface topology does not seem to affect the rise time, that increasing area of the diffusions does not affect the current handling capability, that the breakdown voltage divided by the rise time is almost constant, and that series connection of transistors does not degrade rise time. DOE

N83-36388# Sandia Labs., Albuquerque, N. Mex.

TRANSIENT RESPONSE OF GaAs MICROWAVE POWER FET TO X-RAY PULSES

M. G. Armendariz and J. G. Castle, Jr. 1983 15 p refs Presented at the 2nd Ann. Conf. on Hardened Electron. and Radiation Technol., Oak Ridge, Tenn., 21 Jul. 1983

(Contract DE-AC04-76DP-00789)

(DE83-015103; SAND-83-0479C; CONF-830769-1) Avail: NTIS HC A02/MF A01

The dependence of the time to recover normal microwave output and of the peak photocurrents in state of the art GaAsFETs on the incident flux of X-rays and on circuit loading are measured. The observed device responses for the medium power GaAsFET AT8150 operated in different test circuits at X-ray intensities up to 9E10 rads(Si)/s are compared. DOE

N83-36389# Cable Technology Labs., Inc., New Brunswick, N.J.

DETERMINATION OF THRESHOLD AND MAXIMUM OPERATING ELECTRIC STRESSES FOR SELECTED HIGH VOLTAGE INSULATIONS. TASK 2: INVESTIGATION OF OIL-FILLED PAPER INSULATED CABLES Progress Report

M. Sosnowski and G. S. Eager, Jr. Jun. 1983 44 p refs

(Contract DE-AC02-80RA-50156)

(DE83-014657; DOE/RA-50156/T1; PR-3; CTL-83-016) Avail: NTIS HC A03/MF A01

Threshold voltage of oil-impregnated paper insulated cables are investigaed. Experimental work was done on model cables specially manufactured for this project. The cables were impregnated with mineral and with synthetic oils. Standard impulse breakdown voltage tests and impulse voltage breakdown tests with dc prestressing were performed at room temperature and at 1000C. The most important result is the finding of very high level of threshold voltage stress for oil-impregnated paper insulated cables. This threshold voltage is approximately 1.5 times higher than the threshold voltage or crosslinked polyethylene insulated cables. DOE

N83-36390# Argonne National Lab., Ill. Chemical Technology Div.

TESTING AND EVALUATION OF ADVANCED LEAD-ACID BATTERIES FOR UTILITY LOAD-LEVELING APPLICATIONS

J. F. Miller, D. O. Corp, E. R. Hayes, F. Hornstra, and N. P. Yao

1983 5 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21 Aug. 1983
(Contract W-31-109-eng-38)
(DE83-014207; CONF-830812-33) Avail: NTIS HC A02/MF A01

Testing and evaluation of advanced lead acid batteries developed by Exide for utility load-leveling applications were conducted at Argonne National Laboratory's National Battery Test Laboratory since April 1982. These batteries (36-kWh and 18-kWh modules) have a projected life of greater than 4000 deep discharge cycles. Results obtained to date from the test program are described. Parametric test results and general performance observations for these batteries are reported. DOE

N83-36391# California Univ., Livermore. Lawrence Livermore Lab.
THE MGX: A HIGH POWER, PULSED MICROWAVE GENERATOR DEVELOPMENT PROJECT
R. Scarpetti, G. Vogtlin, R. Lundberg, S. Burkhart, and W. Hofer 3 Jun. 1983 5 p refs Presented at IEEE Power Electron. Specialists Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract W-7405-eng-48)
(DE83-013791; UCRL-88664; CONF-830621-22) Avail: NTIS HC A02/MF A01

Lawrence Livermore National Laboratory. It will be used for high-power microwave vulnerability and lethality studies, investigation of air breakdown, and high-power microwave diagnostic development. The microwave souuce, a virtual cathode oscillator (VIRCATOR), is initially designed to operate at 8 GHz, with an output power greater than 1 GW, and 70 ns pulse width. The pulsed power source is a modified one-unit FXR Blumlein system charged to approximately 650 kV. A new insulator and electron-beam diode have been designed. In addition, a water-breakdown gap has been included to suppress diode prepulse and to sharpen the pulse rise time. The VIRCATOR has extensively modeled with the MASK code at LINI. Preliminary results are presented. DOE

N83-36392# Westinghouse Electric Corp., Trafford, Pa. Power Circuit Breaker Div.
HIGH-CAPACITY SINGLE-PRESSURE SF6 INTERRUPTERS Final Report
J. R. Rostron, L. E. Berkebile, and H. E. Spindle May 1983 251 p refs Sponsored by EPRI
(DE83-902190; ; EPRI-EL-3100) Avail: NTIS HC A12/MF A01

A high voltage, single pressure, SF6 interrupter with an interrupting capability of 120 kA at 145 kV with a continuous current rating of 5000 A and an interrupting time of 1.5 cycles or less was developed. A second objective of 100 kA at 242 kV was added during the project. Mathematical models were used to extrapolate design requirements from existing data for 63 and 80 kA. Two model puffers, one liquid and the other gas, were designed and tested to obtain data at 100 kA. An interrupter, optimized on the basis of total prospective breaker cost, was designed using the mathematical models. A study was made of the construction materials to operate under the high stress conditions in this interrupter. Existing high speed movies of high current arcs under double flow conditions were analyzed to obtain more information for modeling the interrupter. The optimized interrupter design was built and tested. The interrupting capability confirmed calculations of predicted performance near current zero; however, the dielectric strength after interrupting these high current arcs was not adequate for the 145-kV or the 242-kV ratings. DOE

N83-36075*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISTRIBUTED CONTROL OF LARGE SPACE ANTENNAS
J. M. Cameron, M. Hamidi, Y. H. Lin, and S. J. Wang *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 225-247 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 09C

N83-36305*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LOW NOISE AMPLIFIERS
S. M. Petty and D. L. Trowbridge *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 32 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

N83-36306*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RECEIVERS
H. Donnelly *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 26 p refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N83-36393 Rensselaer Polytechnic Inst., Troy, N. Y.
MASS TRANSFER FROM A CIRCULAR CYLINDER: EFFECTS OF FLOW UNSTEADINESS AND "SLIGHT' NONUNIFORMITIES Ph.D. Thesis
Michael Lawrence Marziale 1982 254 p
Avail: Univ. Microfilms Order No. DA83-03073

The effect of periodic variations in the angle of the flow incident to a turbine blade on its leading edge heat load was investigated measuring a circular cylinder oscillating rotationally in a uniform steady flow A stationary cylinder was used and the transfer rate was measured for Re = 75,000 to 110,000 and turbulence levels from .34% to 4.9%. The accuracy and repeatability of the developed mass transfer technique is about + or - 2%, a large improvement over similar methods. Identical flow conditions were used when the cylinder was oscillated. A Strouhal number range from .0071 to .1406 was covered. Comparisons of the unsteady results indicate that the magnitude of the effect of oscillation is small and dependent on the incident turbulence conditions. Expermments were conducted in which a small amplitude periodic perturbation was superimposed on the mean flow by a woven wire grid. Spanwise traverses of the mean velocity and turbulence quantities and spanwise and circumferential traverses of the mass transfer rate on the cylinder were made. Although the perturbation was measured to be only .25% of the mean velocity and was buried in the stream's turbulence, disproportionately larger 15% variations in the spanwise transfer rate were observed. Dissert. Abstr.

N83-36394 Rensselaer Polytechnic Inst., Troy, N. Y.
THEORETICAL ANALYSIS AND COMPUTER SIMULATION OF THICK INCOMPRESSIBLE LAMINAR/TURBULENT BOUNDARY-LAYER FLOWS ALONG CURVED SURFACES Ph.D. Thesis
Ali Eghlima 1982 231 p
Avail: Univ. Microfilms Order No. DA83-03065

Sets of boundary layer equations accounting for flow field nonuniformities such as curvature effects, normal stress and pressure variations as well as separation, are derived. The boundary layer flow domain is subdivided into a parabolic region where the fluid flow is approximately parallel to the submerged body, and an elliptic region which includes the line of separation where significant interactions between the boundary layer and the outer potential flow occur. Closure for the turbulent flow equations was obtained with submodels to the Reynolds stresses which reflect the effects of transverse curvature and longitudinal curvature as well as thickening of boundary layer. The accuracy of the parabolic equations was tested. For turbulent flow, the results of the derived set of parabolic boundary layer equations was compared with measured data sets for nonseparating flow over the tail of an axisymmetric body. The computer simulation model was written in

FORTRAN IV, and documented in an easy to read user's manual. Dissert. Abstr.

N83-36395 Stanford Univ., Calif.
VELOCITY AND PRESSURE MEASUREMENTS IN THE TURBULENT BOUNDARY LAYER ABOVE MECHANICALLY GENERATED WATER WAVES Ph.D. Thesis
Yiannis Alexandros Papadimitrakis 1982 471 p
Avail: Univ. Microfilms Order No. DA83-01256

The structure of the pressure and velocity fields in the air above mechanically generated water waves was investigated in order to evaluate their contribution in the transfer of momentum and energy from wind to water waves. The nonlinearities of the propagating water wave and the drift current seem to introduce pressure components at frequencies other than that of the main wave. Wave-wave resonant interactions and wave-turbulence nonlinear interactions are also responsible for the strong wave induced pressure harmonics. The momentum and energy transfer rates supported by the waves were found to be dominated by the wave induced pressure, but the transfer of the corresponding total quantities to both waves and currents may or may not. The contribution of the wave induced Reynolds stresses to the transfer processes is negligible. The momentum and energy partition between waves and currents is sensitive to the wind field. The water surface condition varies between the transition region and the fully rough regime. At high wind speeds the water surface becomes aerodynamically rough. Dissert. Abstr.

N83-36396# Japan Society for Aeronautical and Space Sciences, Tokyo.
TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES, VOL. 25, NO. 68
Hiroyuki Takata, ed. Aug. 1982 61 p refs
(ISSN-0549-3811) Avail: NTIS HC A04/MF A01

Three articles on fluid flow are presented. Development of an axial flow turbine and a simplified algorithm for apogee boost motor sizing are also discussed. For individual titles, see N83-36397 through N83-36401.

N83-36397# Tokyo Univ. (Japan). Dept. of Mathematical Engineering and Instrumentation Physics.
A SIMPLE THEORY OF THE FIELD EQUATION IN THE INTERMEDIATE REGION OF FLOW AUT 01OSHIMA, NOBUNORI
In Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1982 p 69-79 refs Original language document was announced as A82-47067 (For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

A numerical model is developed for the linear interaction of a flow with a spherical particle. The particle is acted upon by drag, thermal, and pressure gradient forces. Boundary conditions on the particle surface are defined by means of Maxwell's hypothesis of partly specular and partly diffuse reflection. The form of the model is determined by an expansion of the Boltzmann equation through use of a weighted Chapman-Enscog procedure, yielding a trimmed Burnett equation for stable conditions. M.S.K.

N83-36398# National Space Development Agency, Tokyo (Japan). First Group of Satellite Design.
SIMPLIFIED ALGORITHM FOR APOGEE BOOST MOTOR SIZING **c13**
Masao Furukawa *In* Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1982 p 80-90 Original language document was announced as A82-47068 (For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

An analysis of expressions for direct calculations of apogee motor firing (AMF) dynamic position characteristics is presented in order to develop a numerical model of optimized fuel loading for the apogee boost motor (ABM) for orbit transfer to GEO station. A sequence of three velocity maneuvers is considered as the minimal means for attaining the desired longitudinal range. An example is provided ot ABM sizing in the case of a 150 deg reorientation in orbits. Attention is given to a case where only one ground station has telemetry contact with a spacecraft, and a table is generated for AMF attitudes, optimal maneuver sequences, and minimum fuel consumption. M.S.K. (IAA)

N83-36399# Mitsubishi Heavy-Industries Ltd., Nagoya (Japan). Engine Dept.
DEVELOPMENT OF HIGH LOADING, HIGH EFFICIENCY AXIAL FLOW TURBINE **c07**
Kenjiro Takeshima, Yoshihito Tonomura, Tomohiko Satoo (Takasago Inst.), Hiroyuki Nouse (National Aerospace Lab., Tokyo), Mitsuhiro Minoda (National Aerospace Lab., Tokyo), and Kitao Takahara (National Aerospace Lab., Tokyo) *In* Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1983 p 91-103 refs Original language document was announced as A82-47069 (For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

Results of an experimental investigation of a high loading, high efficiency, axial flow turbine are presented. A numerical model is developed for the streamline along the stages using the Euler equation of radial motion. A tailored spanwise static pressure distribution is found to be available by control and combination of the vortex and meridional velocity distribution. An analytical method was employed to minimize the rate of diffusion on the airfoil blade surface. M.S.K. (IAA)

N83-36400# Kanazawa Univ. (Japan). Dept. of Mechanical Engineering.
UNSTABLE PHENOMENON OF INTERNAL FLOW IN WALL-ATTACHMENT FLUID AMPLIFIER
Manabu Sano *In* Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1983 p 104-113 refs Original language document was announced as A82-47070 (For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

An analytical and experimental investigation of the geometric shapes and oscillations which occur in the internal flow of a fluid amplifier attached to a wall is discussed. The instability is assumed to have three phases, i.e., an inflow into the low pressure bubble through the control port, a division in the jet and inhibition of the entrainment flow, and an inflow into the low pressure bubble from the gap between the attachment streamline and the side wall end. A continuous oscillation then appears when the jet switches to the unattached side of the output port and back to the attached side repeatedly. Equations are developed for the geometrical shapes that cause instability in the fluid amplifier and for the oscillating frequency. M.S.K. (IAA)

N83-36401# National Aerospace Lab., Tokyo (Japan). Second Aerodynamic Div.
A NUMERICAL STUDY OF FLOW PAST A ROTATING FLAT PLATE BY THE DISCRETE VORTEX METHOD
Yoji Ishida *In* Japan Society for Aeronautical and Space Sciences Trans. of the Japan Soc. for Aeron. and Space Sci., Vol. 25, No. 68 Aug. 1982 p 114-125 refs Original language document was announced as A82-47071 (For primary document see N83-36396 24-34)
Avail: NTIS HC A04/MF A01

Flow past a flat plate rotating about an axis perpendicular to the main flow was examined using the discrete vortex method. Vortices enter the flowfield at fixed positions around the plate edges at an angular interval of six deg, with strengths determined by the Kutta condition. Consideration is given to an impulsive start-up of the plate, rotation with a constant angular speed, for a change in the spin parameter, and with various vortex reduction factors. Time dependent alterations of lift, drag, and moment are derived, as are the vortex flow pattern and the streamlines. The results are shown to agree well with experimental data. M.S.K. (IAA)

N83-36402*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.

SPAR IMPROVED STRUCTURE/FLUID DYNAMIC ANALYSIS CAPABILITY Interim Report, Aug. 1982 - Aug. 1983

J. Tinsley Oden and Mark L. Pearson Aug. 1983 112 p refs

(Contract NAS8-34975)

(NASA-CR-170875; NAS 1.26:170875; LMSC-HREC-TR-D867285) Avail: NTIS HC A06/MF A01 CSCL 20D

The capability of analyzing a coupled dynamic system of flowing fluid and elastic structure was added to the SPAR computer code. A method, developed and adopted for use in SPAR utilizes the existing assumed stress hybrid plan element in SPAR. An operational mode was incorporated in SPAR which provides the capability for analyzing the flaw of a two dimensional, incompressible, viscous fluid within rigid boundaries. Equations were developed to provide for the eventual analysis of the interaction of such fluids with an elastic solid. S.L.

N83-36403# Princeton Univ., N. J. Dept. of Chemical Engineering.

EFFECTS OF FLOW AND NON-NEWTONIAN FLUIDS ON NONSPHERICAL CAVITATION BUBBLES

William R. Schowalter and Stuart K. Hara 10 Apr. 1983 187 p refs

(Contract N00014-79-C-0385; NR Proj. 062-637)

(AD-A129130) Avail: NTIS HC A09/MF A01 CSCL 20/4

Flow cavitation is substantially altered, both at inception and during subsequent dynamics, by the addition of small amounts of water-soluble polymer. Theoretical and experimental single-bubble systems developed here trace the shape of a bubble as it is influenced by a volume change of the cavity, the rheology of the surrounding fluid, the presence of a solid wall, and/or an imposed external flow. The theoretical formulation pertains to a bubble in a fluid which is infinite in extent and contains no barriers or interfaces apart from the bubble surface. An external flow can be imposed, imparting a stress history. In addition, a spherical bubble profile, obtained from present experiments or theories, dictates a volume change and drives the non-sphericities. Author (GRA)

N83-36404# Wisconsin Univ., Madison. Mathematics Research Center

RAY METHOD FOR FLOW OF A COMPRESSIBLE VISCOUS FLUID Technical Summary Report

M. C. Shen Mar. 1983 23 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-800-1960)

(AD-A129098; MRC-TSR-2500) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author describes an asymptotic method to solve the linearized Navier-Stokes equations governing the flow of a compressible viscous fluid subject to free surface and rigid bottom boundary conditions. The solution of these equations is assumed to consist of a phase function and an amplitude function. It is found that the phase function satisfies the Hamilton-Jacobi equation, and the first order approximation to the amplitude function satisfies a transport equation. The Hamilton-Jacobi equation may be solved by means of the method of characteristics, which reduces the equation to a set of ordinary differential equations. Their solutions determine a family of time-space curves called rays. The transport equation can be easily integrated along each ray to yield the so-called conservation relation. At certain anomalies the amplitude function becomes infinite and a uniform expansion is then constructed to remove these difficulties. GRA

N83-36405# Wisconsin Univ., Madison. Mathematics Research Center.

INSTABILITY OF THE FLOW OF IMMISCIBLE LIQUIDS WITH DIFFERENT VISCOSITIES IN A PIPE Technical Summary Report

D. D. Joseph, M. Renardy, and Y. Renardy Apr. 1983 61 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A129097; MRC-TSR-2503) Avail: NTIS HC A04/MF A01 CSCL 20/4

The authors study the flow of two immiscible fluids of different viscosities and equal density through a pipe under a pressure gradient. This problem has a continuum of solutions corresponding to arbitrarily prescribed interface shapes. The question therefore arises, which of these solutions are stable and thus observable. Experiments have shown a tendency for the thinner fluid to encapsulate the thicker one. This has been explained by the viscous dissipation principle, which postulates that the amount of viscous dissipation is minimized for a given flow rate. For a circular pipe, this predicts a concentric configuration with the more viscous fluid located at the core. A linear stability analysis, which is carried out numerically, shows that while this configuration is stable when the more viscous fluid occupies most of the pipe, it is not stable when there is more of the thin fluid. Therefore the dissipation principle does not always hold, and the volume ratio is a crucial factor. GRA

N83-36406# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.

EIGENFREQUENCIES OF INERTIAL OSCILLATIONS IN A ROTATING FLUID VIA A NUMERICAL SIMULATION Final Report

Raymond Sedney, Nathan Gerber, and Joan M. Bartos May 1983 47 p refs

(DA Proj. 1L1-61102-AH-43)

(AD-A129088; AD-F300256; ARBRL-TR-02488) Avail: NTIS HC A03/MF A01 CSCL 19/1

An understanding of the instability of a spinning liquid-filled projectile requires a knowledge of the wave system in the rotating fluid. The axisymmetric wave system in a cylinder is studied by a numerical simulation; the particular case of perturbed solid body rotation is treated. Finite-difference solutions to the Navier-Stokes equations provide data from which wave frequencies and damping can be extracted using Fourier transform and digital filter techniques. The frequency and damping are compared with the values computed from a linearized eigenvalue analysis. It is found that the latter can be used with confidence for Reynolds number as low as 1,000. GRA

N83-36407# Wisconsin Univ., Madison. Mathematics Research Center.

STABLE VISCOSITIES AND SHOCK PROFILES FOR SYSTEMS OF CONSERVATION LAWS

Robert L. Pego Apr. 1983 26 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A129179; MRC-TSR-2504) Avail: NTIS HC A03/MF A01 CSCL 12/1

Many equations of mathematical physics take the form of nonlinear hyperbolic systems of conservation laws. With small dissipative effects neglected, typically smooth solutions must develop discontinuities (shocks) in finite time. Re-incorporating dissipation helps select those discontinuities which are physically relevant. For this purpose, many different sorts of dissipation will do; in particular, the physical viscosity is typically degenerate and not convenient. In this paper the author provides an understanding of what high order viscosity terms smooth the physical discontinuities. A natural class of admissible viscosity terms is determined based on a simple linearized stability criterion. In addition, they determine a class of degenerate second order viscosity terms of physical type which are admissible. These results are applied to the equations of compressible fluid dynamics, to determine what conditions ensure the existence of the shock layer with viscosity and heat conduction. This should be of interest to others interested in general equations of state for compressible fluids, such as those investigating phase transitions. GRA

N83-36408# Wisconsin Univ., Madison. Mathematics Research Center.

SOME NEW GRAVITY WAVES IN WATER OF FINITE DEPTH

Jean-Marc Vanden-Broeck Mar. 1983 18 p refs

(Contract DAAG29-80-C-0041)

(AD-A129178; MRC-TSR-2499) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a recent paper Chen and Saffman showed that periodic

gravity waves in water of infinite depth are not unique. They presented explicit computations for new families of waves which they termed irregular waves. In the present paper the authors give conclusive numerical evidence that periodic gravity waves in water of arbitrary uniform depth are not unique. Explicit computations of irregular waves in water of finite depth are presented. In addition, they show that Chen and Saffman's bifurcation point for an irregular wave of class 2 is not unique. Results suggest the existence of an infinite number of such bifurcation points. GRA

N83-36409# Wisconsin Univ., Madison. Mathematics Research Center.
EXISTENCE OF SOLUTIONS TO THE NONHOMOGENEOUS STEADY NAVIER-STOKES EQUATIONS
Charles J. Amick Apr. 1983 25 p refs
(Contract DAAF29-80-C-0041)
(AD-A129171; MRC-TSR-2509) Avail: NTIS HC A02/MF A01 CSCL 20/4

This paper concerns the existence of steady solutions to the Navier-Stokes equations in a bounded domain. The condition of solenoidality for the velocity field imposes a necessary condition on the boundary data. For a certain class of symmetrical domains, the authors show that this necessary condition implies the existence of a solution to the problem. The method consists of proving a priori bounds on solutions by assuming the contrary, rescaling the equations, and then arriving at a solution to the steady Euler equations in the limit. Examination of this equation leads to the desired contradiction. After one has suitable bounds on any solutions, one uses the Leray-Schauder theorem to prove existence. In addition, the authors remark on the problem of a general bounded domain, and suggest how certain maximum principles might yield the expected results. GRA

N83-36410# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
TURBULENT BOUNDARY LAYERS DEVELOPING OVER COMPLIANT SURFACES Final Report, 1 Mar. 1982 - 1 Mar. 1983
S. G. Lekoudis and Tapan Sengupta 6 May 1983 20 p refs
(Contract N00014-82-K-0271)
(AD-A129724) Avail: NTIS HC A02/MF A01 CSCL 20/4

The problem of reducing drag due to skin friction remains of interest. This is the case because of the significant benefits that would result from an application of a drag reducing scheme on airplanes, ships or underwater vehicles. One of the techniques that have been proposed for such a scheme is wall compliance. Wall compliance could, in principle, work in two ways: either it could delay transition, or it could modify the inner part of a turbulent boundary layer so that reduced skin friction would result. The objective of this research program was to develop prediction techniques for high Reynolds number turbulent flows over compliant surfaces. This objective was pursued by evaluating the wall induced Reynolds stresses using solutions of the liner momentum equations. GRA

N83-36411# Naval Research Lab., Washington, D. C.
EXPERIMENTAL METHODS FOR STUDYING THE RAYLEIGH-TAYLOR INSTABILITY OF ABLATIVELY ACCELERATED TARGETS Interim Report
J. Grun, M. H. Emery, M. J. Herbst, E. A. McLean, S. P. Obenschain, B. H. Ripin, J. A. Stamper, and R. R. Whitlock 17 Jun. 1983 32 p refs Presented at the 12th Ann. Anomalous Absorption Conf., Santa Fe, N. Mex., 10-13 May 1982 and at the 24th Ann. Meeting of the APS Div. of Plasma Phys., New Orleans, 1-5 Nov. 1982
(Contract DE-AI08-79DP-40092)
(AD-A129774; DE83-013621; NRL-MR-4896) Avail: NTIS HC A03/MF A01 CSCL 20/4

The authors describe new diagnostic methods for the study of hydrodynamic instabilities in ablatively accelerated targets. These methods include face-on X-ray backlighting that does not require a backlighting laser beam (for growth rate measurement), and a tracer dot technique (for tracking ablation plasma flow). The targets in the experiments are periodically perturbed to provide initial conditions for the growth of the Rayleigh-Taylor instability.
Author (GRA)

N83-36412# Wisconsin Univ., Madison. Center for Mathematics Research.
NONLINEAR GRAVITY-CAPILLARY WAVES ON A COMPRESSIBLE VISCOUS FLUID WITH EDGE CONSTRAINTS
M. C. Shen May 1983 22 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A130545; MRC-TSR-2520) Avail: NTIS HC A02/MF A01 CSCL 20/4

An asymptotic method is developed for the study of gravity-capillary waves in a compressible viscous fluid with edge constraints in an inclined, straight channel. The Navier-Stokes equations subject to free surface and rigid bottom conditions are reduced to a sequence of elliptic boundary problems over a cross section of the channel. Their solutions are used to determine the wave speed and to construct the Burgers equation for the evolution of the gravity-capillary waves. The Burgers equation may become ill-posed when the Reynolds number exceeds some critical value. A criterion for the stability of the flow is then defined in terms of the critical Reynolds number. Author (GRA)

N83-36413# Wisconsin Univ., Madison. Mathematics Research Center.
TRANSONIC SMALL-DISTURBANCE THEORY FOR DUSTY GASES Technical Summary Report
Donald A. Drew (Rensslaer Polytechnic Inst.) and Fredrick J. Ziegler (General Dynamics/Fort Worth, Tex.) May 1983 27 p refs
(Contract DAAG29-80-C-0041)
(AD-A130511; MRC-TSR-2521) Avail: NTIS HC A03/MF A01 CSCL 12/1

The correction to transonic small-disturbance theory induced by the addition of contaminant particles (e.g., dust) to the gas is analyzed. Two-phase flow equations governing the particles and inviscid fluid are used. The dusty gas version, a particular limit of the flow equations in which the volumetric concentration of the particles is small, but the mass concentrations of particles and fluid are comparable, is employed. In this setting, a model in which the gas and particles may be viewed as an equivalent gas with modified properties, is derived. This generalized gas model behaves like a normal gas with a modified value (the ratio of specific heats). Using this model, a simple method of analyzing transonic small-disturbance theory, by employing a modified transonic similarity parameter, is used to account for the effect of the dust.
Author (GRA)

N83-36414# Wisconsin Univ., Madison. Mathematics Research Center.
THE EFFECT OF SURFACE TENSION ON THE SHAPE OF THE KIRCHHOFF JET
Jean-Marc Vanden-Broeck May 1983 19 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A130497; MRC-TSR-2524) Avail: NTIS HC A02/MF A01 CSCL 20/4

The effect of surface tension on the shape of a two dimensional jet emerging from an orifice is considered. It is shown that the slope of the surface profile of the jet is not continuous at the separation points. Both velocity and curvature are infinite at these points. The problem is solved numerically by series truncation. Jet profiles are presented for various values of the surface tension. In addition, perturbation solutions for both small and large values of the surface tension are derived. Author (GRA)

N83-36415# Dayton Univ., Ohio.
ASYMPTOTIC FAR FIELD CONDITIONS FOR UNSTEADY SUBSONIC AND TRANSONIC FLOWS Final Report, Jun. - Dec. 1982
Karl G. Guderley Wright-Patterson AFB, Ohio AFWAL Apr. 1983 148 p refs
(Contract F33615-81-K-3216; AF Proj. 2304)
(AD-A129268; UDR-TR-82-143; AFWAL-TR-83-3044) Avail: NTIS HC A07/MF A01 CSCL 20/4

Far field conditions for unsteady flow at subsonic and transonic Mach numbers are derived under the assumption that the changes that occur in the flow field are not too slow. One then can derive far field conditions from analytic expressions which approximate the behaviour of wave fronts and sound rays at large distances. In subsonic blows, one uses for this purpose equations linearized for the vicinity of a parallel flow with the free stream Mach number. This leads to the result of Bayliss, Gunzburger, and Tyrkel, but extended to nonspherical wave fronts. Some theoretical insight from a different point of view is provided by interpreting the waves fronts as characteristic surfaces. The linearization used for subsonic flows fails for free stream Mach number one, because it leads to a pilling up of waves in a plane perpendicular to the free stream direction. A linearization is again carried out but with respect to a flow field in which the term of the steady flow, which dominates at a large distance, is taken into account. GRA

N83-36416# La Jolla Inst., Calif. Center for the Study of Nonlinear Dynamics.
NONLINEAR PROPERTIES OF MATERIALS Final Report
Bruce J. West and M. F. Shlesinger 30 Sep. 1983 14 p refs
(Contract MDA903-82-C-0053)
(AD-A129311; LJI-R-83-235) Avail: NTIS HC A02/MF A01 CSCL 20/4

Investigation is made on such diverse phenomena as turbulence, extreme properties of stochastic systems, the statistics of nonlinear wave-wave interactions and the detection of clustered events. One of the theories developed to explain the transition from laminar to turbulent flow is through the use of intermittent turbulent bursts interacting with the laminar flow to generate more bursts and thus form a cascade to a fully developed turbulent state. Thus, the statistical distribution of such bursts is important in determining the rate of transition from laminar to turbulent fluid flow and can thereby strongly influence the drag properties of fluid flowing past a body. A second process in which intermittency is important is the anomolous transport of charge in amorphous materials. The current flow in these materials exhibits a clustering of events in time not unlike that observed in fluid turbulence. In both of these systems the physical observables, e.g. the correlation function, exhibit scaling behavior with exponents characteristic of the process. A final example is the stress relaxation of polymers, in which case the scaling behavior effects such material properties as brittleness, dielectric loss, etc. A new random walk model is developed which greatly increases our understanding of such processes. GRA

N83-36417# Princeton Univ., N. J. Dept. of Chemistry.
STUDIES IN NON-EQUILIBRIUM STATISTICAL MECHANICS Final Technical Report, 30 Sep. 1978 - 29 Sep. 1982
Herschel Rabitz Sep. 1982 19 p refs
(Grant AF-AFOSR-3724-78; AF Proj. 2303)
(AD-A129338; AFOSR-83-0467TR) Avail: NTIS HC A02/MF A01 CSCL 08/4

The research accomplished under the stated contract is summarized with work performed in the following primary areas: Stochastic dynamics; Sensitivity analysis; Collisional scaling theories; and Quantum collision dynamics. Author (GRA)

N83-36418# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
VISCOUS EFFECTS IN THE WEDEMEYER MODEL OF SPIN-UP FROM REST Final Report
Raymond Sedney and Nathan Gerber Jun. 1983 53 p refs Supersedes ARBRL-IMR-766
(DA Proj. 1L1-61102-AH-43)
(AD-A129506; AD-F300262; ARBRL-TR-02493; ARBRL-IMR-766) Avail: NTIS HC A04/MF A01 CSCL 19/1

The problem of impulsive spin-up from rest of a liquid filled a right- circular cylinder is treated. A numerical solution is obtained to the non- linear partial differential equation that governs the spin-up flow by the Wedemeyer model. An implicit, two-time level, second order, iterative finite difference technique is used. Approximations to an impulsive start are discussed. An analytical procedure is applied at the first time step of the calculation to avoid errors caused by a discontinuity in the boundary conditions. Conditions for the validity of the model are discussed and a detailed discussion is presented of the Ekman compatibility condition relating to azimuthal velocity. Representative results are shown demonstrating the effects of the problems parameters and different Ekman compatibility conditions on spin-up profiles, i.e., curves of azimuthal velocity vs radial coordinate. For several cases the spin-up results are validated by comparison with those of the Navier-Stokes equations. GRA

N83-36419# Pennsylvania State Univ., University Park. Applied Research Lab.
EFFECT OF PRESSURE GRADIENT ON CAVITATION ICEPTION FROM AN ISOLATED SURFACE ROUGHNESS M.S. Thesis
Masaru Tada 18 Oct. 1982 108 p refs
(Contract N00024-79-C-6043)
(AD-A129998; ARL/PSU/TM-82-218) Avail: NTIS HC A06/MF A01 CSCL 20/4

An experimental investigation was carried out for the case of different triangular protrusions, to study the cavitation characteristics in the presence of a pressure gradient. The shape factor and wake parameter were calculated from the pressure gradient and the boundary layer parameters with the assistance of computer programs based on the method of E. Truckenbrodt. Limited cavitation numbers were obtained visually for the flow with different cases of zero, favorable and unfavorable pressure gradient. For the case of zero pressure gradient, a power law relationship was established between the limited cavitation number and the relative height and Reynold's number based on boundary layer thickness. In addition, the comparison of the power law obtained by the present investigation with that by Holl was carried out. Furthermore, a development of the characteristic velocity theory was made semi-empirically. For a flow with pressure gradient, the power law relationship was extended to include the influence of shape factor. GRA

N83-36420# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A NONSIMILAR SOLUTION FOR BLAST WAVES BY AN ASYMPTOTIC PISTON EXPANSION Final Report
Mark L. Bundy Jun. 1983 26 p refs
(Contract DA Proj. 1L1-61102-AH-43)
(AD-A130012; AD-F300272; ARBRL-TR-02497) Avail: NTIS HC A03/MF A01 CSCL 19/4

An analytical technique is outlined for predicting the blast wave from a rapid but asymptotic expansion of an inner piston-like surface. The method more accurately describes real blasts compared to conventional point source models and agrees favorably with the exact method of characteristic solution for wave Mach numbers exceeding approximately 1.1. The method makes two a priori assumptions: (1) that the blast wave density can be described by a power law, and (2) that an equation exists for the motion of the driving piston. The present treatment extends the work of Bach and Lee, who assume a zero radius piston (i.e., a point source). GRA

N83-36421# Stanford Univ., Calif. Joint Inst. of Aeronautics and Acoustics.
ON THE STRUCTURE OF AN UNDEREXPANDED RECTANGULAR JET Interim Report
A. Krothapalli, Y. Hsia, D. Baganoff, and K. Karamcheti Jul. 1982 56 p refs
(Contract F49620-79-C-0189; AF Proj. 2307)
(AD-A129227; SU-JIAA-TR-47; AFOSR-83-0454TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

An experimental investigation was carried out on an underexpanded jet of air issuing from a converging rectangular nozzle of moderate aspect ratio. Schlieren pictures of the flow field along with hot-wire measurements in the jet were obtained at different pressure ratios. At the pressure ratio corresponding to the maximum screeching sound, Schlieren photographs show a very strong organized cylindrical wave pattern on either side of the jet, with

their respective sources being located at the end of the third shock cell. Associated with this wave pattern is a large increase in the angle of spread of the jet. It is shown that the self excitation helps to induce large-scale vortical motions in the jet both in the plane containing the small dimension of the nozzle and in the plane containing the long dimension of the nozzle. However, the locations of these structures are different in the two planes. Nevertheless, the characteristic Strouhal number corresponding to these large-scale structures in both planes is the same and equal to 0.12. The influence of the self excitation on the mean velocities and rms intensities was investigated. For the full range of pressure ratios studied, similarity was found both in the mean velocity and rms intensity profiles in the two central planes beyond 80 widths downstream of the nozzle exit. However, the shapes of the similarity profiles are different in the two planes. For the downstream distances studied, complete axisymmetry (identical mean velocity profiles in both planes) was not found, which suggests it may persist for a large distance downstream of the nozzle exit. Author (GRA)

N83-36422# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

PROPERTIES OF ACTUAL AND NUMERICAL SHOCK AND BLAST WAVE PHENOMENA Final Report, 1 Mar. 1980 - 28 Feb. 1983

I. I. Glass Apr. 1983 34 p

(Contract DAAG29-80-C-0077)

(AD-A129483; ARO-16972.11-EG) Avail: NTIS HC A03/MF A01 CSCL 19/4

Considerable progress was made in the areas of application of the random-choice method to explosion and implosion dynamics (flows with changes in area and detonation) and weak spherical shock-wave transitions (flows with viscosity, heat conduction), and vibrational excitation - a first). Some progress was also made in applying the fluid-in-cell technique to oblique-shock-wave reflections (OSWR). The method looks promising. A great deal of experimental and analytical work was achieved on OSWR in air and SF6. The dusty-gas shock tube is being assembled. Two analytical papers on dusty-gas shock-tube flows have appeared in the Proceedings of the Royal Society of London with AFOSR support, as well as other papers and UTIAS reports. Author (GRA)

N83-36423# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.

TWO-COMPONENT SIMULTANEOUS LDV (LASER DOPPLER VELOCIMETER) TURBULENCE MEASUREMENTS IN AN AXISYMMETRIC NOZZLE AFTERBODY SUBSONIC FLOW FIELD WITH A COLD, UNDEREXPANDED SUPERSONIC JET Final Report, 1 Oct. 1980 - 30 Sep. 1983

F. L. Heltsley and F. L. Crosswy Arnold AFS, Tenn. AEDC Jun. 1983 124 p refs

(AD-A129606; AEDC-TR-82-27) Avail: NTIS HC A06/MF A01 CSCL 20/4

A test was conducted to obtain nonintrusive measurements in the flow field about an axisymmetric nozzle afterbody with a cold, underexpanded jet, M sub j = 1.563, in a parallel free stream, M sub alpha = 0.6. Reynolds shear stress and two components of mean velocity and turbulence intensity were measured using a two-color Bragg-diffracted laser Doppler velocimeter. Additional experimental data include the afterbody surface pressure distribution and laser vapor screen flow visualization of the jet plume. A multiple seeding technique was used to investigate the bimodal velocity probability distributions observed in the jet mixing region. GRA

N83-36424# Saginaw Valley State Coll., University Center, Mich. Dept. of Physics.

TRANSIENT HEAT TRANSFER IN COATED SUPERCONDUCTORS Final Scientific Report, 1 Jun. 1981 - 1 Sep. 1982

Albert R. Menard 29 Oct. 1983 54 p refs

(Grant AF-AFOSR-0184-81; AF Proj. 2301)

(AD-A129600; AFOSR-83-0504TR; SP-80-10-112) Avail: NTIS HC A04/MF A01 CSCL 20/13

Computer simulation of transient heat transfer from coated superconductors to liquid helium have revealed that coating a superconductor with certain new materials, called Laketites, instead of traditional insulation, such as GE7031, substantially improves the ability of the superconductor to withstand transient heat pulses without making the transition to the normal i.e. non-superconducting state. In the best cases, the length of time that constant heating can be withstood is improved twenty fold. This report shows that the most important property of these new materials is their increased thermal conductivity relative to current materials. The highest thermal conductivity materials designed SC-2, SC-3 are the most desirable for further research and development. The increased specific heat of the Laketites is desirable, but not crucial. Furthermore, the thickness of the coating has little effect on the improved ability of the superconductor to withstand heat pulses. This report recommends a vigorous program of further development of the Laketites. A complete theoretical background of the computer simulation and examples of the programs used are also included in this report. Author (GRA)

N83-36425# Stanford Linear Accelerator Center, Calif.

HEAT FLOW IN A He2-FILLED FIN

Richard P. Warren Jun. 1983 5 p refs Presented at the Cryogenic Eng. Conf. and Intern. Cryogenic Mater. Conf., Colorado Springs, 15-19 Aug. 1983

(Contracts DE-AC02-76ER-03075; DE-AC03-76SF-00515)

(DE83-015086; SLAC-PUB-3143; CONF-830841-1) Avail: NTIS HC A02/MF A01

The problem of heat flow in He 2 is solved for the boundary conditions specified by a fin. The influence of diameter, length, Kapitza conductance, and temperature on the heat carrying capacity of an externally cooled, circular He 2 filled channel with zero net mass flow and of negligible wall thermal resistance is shown. DOE

N83-36426# Brookhaven National Lab., Upton, N. Y.

MINET: TRANSIENT ANALYSIS OF FLUID-FLOW AND HEAT-TRANSFER NETWORKS

G. J. VanTuyle, J. G. Guppy, and T. C. Nepsee 1983 9 p refs Presented at the ASME Intern. Computers in Eng. Conf., Chicago, 7 Aug. 1983 Sponsored in part by the Nuclear Regulatory Commission

(Contract DE-AC02-76CH-00016)

(DE83-011622; BNL-NUREG-32858; CONF-830853-2) Avail: NTIS HC A02/MF A01

The MINET is a computer code which was developed for the steady state and transient analysis of fluid flow and heat transfer networks. The code is based on a momentum integral network method, which offers computational advantages in large systems analysis. An application in which MINET is coupled to the super system code (SSC), an advanced generic code for the transient analysis of loop or pool type IMFBR systems is discussed. The ability of the Clinch River Breeder Reactor Plant to operate in a natural circulation mode following an assumed loss of all electric power, is assessed. The MINET portion of the calculations are compared with those generated independently by the Clinch River Project, using the DEMC code. DOE

N83-36427# Oak Ridge National Lab., Tenn. Energy Div.

SHORT-TUBE SUBCRITICAL FLOW

V. C. Mei 1983 10 p refs Presented at the Cavitation and Multiphase Flow Conf., ASME Fluid Eng. Div., Houston, Tex., 20-23 Jun. 1983

(Contract W-7405-eng-26)

(DE83-003952; CONF-830615-4) Avail: NTIS HC A02/MF A01

The orifice model is generally accepted for the calculation of short-tube subcritical flow. For short tubes used as refrigerant expansion devices, the orifice model is found inadequate due to the wide variation of the upstream and downstream conditions. A correlation is formed so that the influence of length/diameter is addressed. DOE

N83-36428# Battelle Columbus Labs., Ohio.
DESIGN METHODS FOR GROUND-SOURCE HEAT PUMPS
D. A. Ball, R. D. Fischer, and D. Hodgett (Battelle Inst.) 1983 44 p refs Presented at the ASHRAE Summer Meeting, Washington, D.C., 26-29 Jun. 1983
(Contract W-7405-eng-26)
(DE83-014040; CONF-830640-5) Avail: NTIS HC A03/MF A01

Design and performance information on historical and current ground-coil heat-pump systems is assessed along with the adequacy of available design methods and to define Near-future research and development needs to promote the use of this technology are defined. This study concluded that despite an intense effort of experimental work, no suitable general design guidelines have been developed. Modern-day research and development efforts have utilized plastic tubing and computerized analytical techniques. In Europe, there are several well-developed proprietary design and application methodologies for northern climates. However, no publicly available design guidelines exist at the present time. Major uncertainties exist regarding suitable design and installation practice for systems with substantial cooling operation, due to inability of models to deal with moisture migration and soil recession. DOE

N83-36429# Westinghouse Research and Development Center, Pittsburgh, Pa.
A HIGH-EFFICIENCY HEAT-PUMP FAN
T. Wright, R. S. Lackey, and S. E. Veyo 1983 36 p refs Presented at the Am. Soc. of Heating, Refrig., and Air Conditioning Engr., Washington, D.C., 26-29 Jun. 1983
(Contract W-7405-eng-26)
(DE83-024036; CONF-830640-4) Avail: NTIS HC A03/MF A01

Efforts toward development of a high-efficiency outdoor air mover for an advanced electric heat pump are documented. The design goal was to halve the outdoor air-moving electrical power. The prototype air mover at 850 rpm delivers 3070 scfm through the prototype outdoor unit with a pressure drop through the coil of 0.09 inches of water and consumes 150 watts of electrical power. The overall air-moving efficiency is estimated at about 35 percent compared with 19 percent for the conventionally-applied heat pump fan. Although this air mover will cost twice as much as the conventional heat pump air mover, this premium cost should be recoverable in less than four years through energy savings. The sound rating (SFN) for this air mover is less than 20. Means for improving fan efficiency by 5 percentage points, motor efficiency by 2.5 points, and to further quiet the fan were identified. DOE

N83-36430# Oak Ridge Gaseous Diffusion Plant, Tenn. Operations Analysis and Planning Div.
NUMERICAL STUDY OF THE EFFECTS OF CURVATURE ON THE FLUID DYNAMICS OF GAS CENTRIFUGES
J. A. Jordan, M. D. Gunzburger (Carnegie-Mellon Univ.), and H. G. Wood, III (Virginia Univ., Charlottesville) Jun. 1983 57 p refs Presented at the 5th Workshop on Gases in Strong Rotation, Charlottesville, Va., 5-9 Jun. 1983
(Contract W-7405-eng-26)
(DE83-014098; K/OA-5458; CONF-830642-3) Avail: NTIS HC A04/MF A01

A finite element method for the approximate solution of the flow in rapidly rotating gas centrifuges is presented. The Onsager model, as amended by Maslen, is used to derive the model equations to be discretized. The pancake effects are not assumed in the model. The hydrodynamics of a gas centrifuge, numerical examples done with and without these curvature terms are presented. Two flow models are used, one for flow driven by a linear temperature gradient along the wall and the other for flow driven by axial mass fluxes through the end caps of the centrifuge. DOE

N83-36431# California Univ., Livermore. Lawrence Livermore Lab.
APPLICATION OF A MODIFIED FINITE ELEMENT METHOD TO THE TIME-DEPENDENT THERMAL CONVECTION OF A LIQUID METAL
Philip M. Gresho and Craig D. Upson Mar. 1983 15 p refs Presented at the 3rd Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Seattle, 8-11 Aug. 1983
(Contract W-7405-eng-48)
(DE83-009847; UCRL-88990; CONF-830803-8) Avail: NTIS HC A02/MF A01

The Galerkin finite element method and the simplest appropriate isoparametric element for modeling the Navier-Stokes equations, the spatial approximation in two ways for cost effectiveness, the methods are mass matrix is lumped and all coefficient matrices are generated via one point quadrature. The modified semi-discretized equations are integrated in time bu use of the explicit Euler method in a special way to compensate for that portion of the time truncation error which is intolerable for advection dominated flows. The scheme is completed by the introduction of a subcycling strategy which permits less frequent updates of the pressure field with little less of accuracy. The techniques are summarized and simulated free convection in a two dimensional box at Ra = 10(5) and Pr = 0.01 is described. DOE

N83-36432# Desert Research Inst., Reno, Nev.
TURBULENT VERTICAL MOMENTUM TRANSFER IN STRATIFIED ENVIRONMENTS
Richard R. French and Steve C. McCutcheon Mar. 1983 40 p refs
(Contract DI-14-34-0001-1130)
(PB83-196634; PUB-41079; W83-02901; OWRT-A-099-NEV(1)) Avail: NTIS HC A03/MF A01 CSCL 20D

A uniform data base is used to compare five hypotheses of vertical momentum transfer in stratified free surface flow in which the primary source of turbulence is bottom boundary shear. The hypotheses examined includes those of Rossby and Montgomery, Kent and Pritchard, Odd and Rodger, French, and McCutcheon. Of the hypotheses examined, four involved one or more free coefficients while the hypothesis of McCutcheon involves no free coefficients. While the hypothesis of French provides the best fit of the data with two free coefficients, the hypothesis of McCutcheon with some modification and no free coefficients is very promising. In comparing these hypothesis, the problem of experimental error is also considered. GRA

N83-36433# Iowa Inst. of Hydraulic Research, Iowa City.
CALCULATION OF UNSTEADY BOUNDARY LAYERS
A. N. Menendez and B. R. Ramaprian Aug. 1982 116 p refs
(Contracts DAAG29-79-G-0017; DAAG29-83-K-0004)
(PB83-207746; IIHR-248) Avail: NTIS HC A06/MF A01 CSCL 20D

A relatively simple, yet efficient and accurate finite difference method is developed for the solution of the unsteady boundary layer equations for both laminar and turbulent flows. The numerical procedure is subjected to rigorous validation tests in the laminar case, comparing its predictions with exact analytical solutions, asymptotic solutions, and/or experimental results. In particular, the calculations of periodic boundary layers are shown to be accurate from low to very high oscillation frequencies, for small and large amplitudes, for zero, as well as adverse time mean pressure gradients, and even in the presence of significant flow reversal. The numerical method is then applied to predict two series of experimental periodic turbulent boundary layers, using simple quasi-steady closure models. GRA

N83-36266# Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
MEAN SKIN TEMPERATURE WEIGHTED BY SKIN AREA, HEAT TRANSFER COEFFICIENTS AND THERMAL SENSITIVITY
Tohru Mochida *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 1-10 refs (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

N83-36267# Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
CHARACTERISTICS OF WETTEDNESS AND EQUI-SKIN

TEMPERATURE LINE IN THE EVAPORATIVE REGULATION REGION
Tohru Mochida *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 11-21 refs (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N83-36434*# IIT Research Inst., Chicago, Ill.
TECHNICAL AND INVESTIGATIVE SUPPORT FOR HIGH DENSITY DIGITAL SATELLITE RECORDING SYSTEMS Interim Report, Jan. - Feb. 1982
Feb. 1982 39 p
(Contract NAS5-26493)
(NASA-CR-170586; NAS 1.26:170586; IR-E6514; IR-E6519) Avail: NTIS HC A03/MF A01 CSCL 14B

Availability of tape in suitable widths continue to obstruct standardized methods on tests where width is an important parameter. These tests include flexibility, coefficients of friction, and abrasivity. The Fuji Beridox tape samples evaluated were obtained from a 1/2 inch video cassette. N.W.

N83-36435*# Odetics, Inc., Anaheim, Calif.
HIGH DENSITY TAPE/HEAD INTERFACE STUDY Final Report
L. C. Csengery Apr. 1983 36 p
(Contracts NAS5-26572; NAS5-26571)
(NASA-CR-170592; NAS 1.26:170592; O-911010) Avail: NTIS HC A03/MF A01 CSCL 14B

The high energy (H sub c approximately or = to 650 oersteds) tapes and high track density (84 tracks per inch) heads investigated had, as its goal, the definition of optimum combinations of head and tape, including the control required of their interfacial dynamics that would enable the manufacture of high rate (150 Mbps) digital tape recorders for unattended space flight. S.L.

N83-36436*# RCA Government Communications Systems, Camden, N. J. Digital Communications and Recording Systems.
TAPE/HEAD INTERFACE STUDY Final Report
25 May 1983 105 p
(Contract NAS5-26573)
(NASA-CR-170594; NAS 1.26:170594) Avail: NTIS HC A06/MF A01 CSCL 14B

Existing high energy tapes, high track density heads, and transport guidance techniques were evaluated and characterized to enable these technologies to be employed in future spacecraft recorders with high confidence. The results of these study efforts demonstrated tracking accuracy tape and head density that will support spacecraft recorders with data rates of a minimum of 150 Mbps and storage capacities ranging from 10 to the 10th to 10 to the 11th bits. Seven high energy tapes of either .25 in width, 1.00 in width, or both, were tested. All tapes were tested at the same speed (30 ips) and the same packing density (33 KBI). The performance of all 1 in tapes was considered superior. N.W.

N83-36437*# IIT Research Inst., Chicago, Ill. Magnetic Recording.
TECHNICAL AND INVESTIGATIVE SUPPORT FOR HIGH DENSITY DIGITAL SATELLITE RECORDING SYSTEMS Progress Reports, Apr. - Jun. 1982
R. A. Schultz Jul. 1982 141 p
(Contract NAS5-26493)
(NASA-CR-170595; NAS 1.26:170595; PR-8; PR-9; PR-10; PR-11) Avail: NTIS HC A07/MF A01 CSCL 14B

Methods and results of examinations and tests conducted on magnetic recording tapes under consideration for a high density digital (HDDR) satellite recording system are described. The examinations and tests investigate the performance of tapes with respect to their physical, magnetic and electrical characteristics. The objective of the tests, the likely significance of typical results, and the importance of the characteristics under investigation to the application are included. Theoretical discussions of measurement methods are provided where appropriate. Methods and results are discussed; the results of some sections are tabulated together to facilitate their comparison. The conclusion of each test section relates the test results to their possible significance and attempts to correlate the results of that section with the results of other tests. Some of the sections analyze sources of error inherent in the measurement methods or relate the value of the information obtained to the objectives of the test or the overall purpose of the project. N.W.

N83-36438*# IIT Research Inst., Chicago, Ill.
TECHNICAL AND INVESTIGATIVE SUPPORT FOR HIGH DENSITY DIGITAL SATELLITE RECORDING SYSTEMS Progress Report, Nov. 1982 - Jan. 1983
R. A. Schultz Feb. 1983 21 p
(Contract NAS5-26493)
(NASA-CR-170597; NAS 1.26:170597; PR-16; PR-18) Avail: NTIS HC A02/MF A01 CSCL 14B

Recent results of dropout measurements and defect analysis conducted on one reel of Ampex 721 which was submitted for evaluation by the manufacturer are described. The results or status of other tape evaluation activities are also reviewed. Several changes in test interpretations and applications are recommended. In some cases, deficiencies in test methods or equipment became apparent during continued work on this project and other IITRI tape evaluation projects. Techniques and equipment for future tasks such as tape qualification are also recommended and discussed. Project effort and expenditures were kept at a relatively low level. This rate provided added development time and experience with the IITRI Dropout Measurement System, which is approaching its potential as a computer based dropout analysis tool. Another benefit is the expanded data base on critical parameters that can be achieved from tests on different tape types and lots as they become available. More consideration and effort was directed toward identification of critical parameters, development of meaningful repeatable test procedures, and tape procurement strategy. N.W.

N83-36439*# IIT Research Inst., Chicago, Ill.
TECHNICAL AND INVESTIGATIVE SUPPORT FOR HIGH DENSITY DIGITAL SATELLITE RECORDING SYSTEMS Progress Report, Jul. - Oct. 1982
R. A. Schultz Oct. 1982 80 p
(Contract NAS5-26493)
(NASA-CR-170598; NAS 1.26:170598; PR-12; PR-15) Avail: NTIS HC A05/MF A01 CSCL 01B

Dropout and defect classification are discussed with emphasis on how surface defects responsible for electronic dropouts were identified, what affect various defects could have on the application of tapes to satellite tape recorders (STR), and what type of defects might be field correctable after production of the tape but prior to installation in the STR. N.W.

N83-36440# Massachusetts Inst. of Tech., Cambridge.
CHARACTERIZATION OF ULTRASONIC TRANSDUCER THROUGH TRANSMISSION SYSTEMS Final Report, Jun. 1981 - Sep. 1982
James C. Blough, Samson S. Lee, and James H. Williams, Jr. Dec. 1982 224 p refs
(Contract N00014-81-C-2319)
(AD-A128965) Avail: NTIS HC A10/MF A01 CSCL 20/3

Five different designs of broadband piezoelectric ultrasonic transducers are evaluated and compared to determine the effects

of various transducer design parameters on the transducer response. The transducer tested include the Acoustic Emission Technology (AET) FC-500 transducers, consisting of a 0.073 cubic centimeters (0.029 in) lead metaniobate piezoelement, 0.035 cm (0.014 in) titanium carbide wearplate and 0.635 cubic centimeters (0.250 in) tungsten epoxy backing layer; the AE-101, a prototype identical to the FC-500 except that it has a 0.035 cubic centimeters (0.014 in) aluminum wearplate; and the AE-100, AE-102, and AE-103, also identical to the FC-500 except that they have backing layers of 0.0 cubic centimeters (no backing), 1.270 cubic centimeters (0.500 in), and 1.905 cubic centimeters (0.750 in), respectively. Pairs of each of the transducers are clamped face-to-face and tested with narrow-band continuous sinusoids and tone bursts (0.4 to 3.0 MHz), and with a broadband input signal (1.0 used pulse). GRA

N83-36441# Naval Civil Engineering Lab., Port Hueneme, Calif.
THE REMOTE DATA RECORDER: AN ONBOARD RECORDER FOR THE (TRADEMARK) MAGNOGRAPH NONDESTRUCTIVE TEST WIRE ROPE SENSOR HEAD Final Report, Sep. 1981 - Sep. 1982
L. Underbakke Feb. 1983 18 p
(AD-A128712; NCEL-TN-1657) Avail: NTIS HC A02/MF A01 CSCL 14/3

The remote data recorder allows the sensor head of the nondestructive test wire rope inspection device, the Magnograph TM, to be used without being hardwired to the electronic recorder module. This allows the inspection of wire ropes in remote, hazardous, on inaccessible locations. This report describes the portable data recorder and presents the results of tests performed to evaluate its effectiveness in inspecting wire ropes that are inaccessible to close visual inspection. GRA

N83-36442# Rome Research Corp., New York, N.Y.
DIRECT DIGITAL TARGETING APPLICATIONS AND EXPERIMENTS Final Technical Report, 27 Aug. 1980 - 30 Jun. 1982
Michael J. Gillotte, Jr. Griffiss AFB, N.Y. RADC Jan. 1983 48 p refs
(Contract F30602-80-C-0283; AF Proj. 4594)
(AD-A129267; RRC-82-8; RADC-TR-83-14) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document represents the final technical report for Contract F30602-80-C-0283 to the Rome Air Development Center (RADC) to provide the Experimental Photogrammetric Facility (EPF) with an upgraded Digital Image Target Location demonstration capability. The Softcopy Mensuration Software was modified to provide monoscopic mensuration capability. The DeAnza IP-8500 Display System was purchased and added to the EPF. The architecture of the IP-8500 permits large image roaming which is necessary to perform point transfer experiment with large digital imagery. The software was designed in a modular fashion to permit ease in expanding the system to include multiple sensor models or even multiple implementations of the same sensor models. With this design, experiments could be conducted to compare the output object space coordinates using improved and unimproved sensor position information. Display software is independent of the sensor model and the image warping processes are designed to be a separate module independent of the sensor. Author (GRA)

N83-36443# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CCD CAMERA: A CAMERA THAT DOES NOT USE FILMS
Chien-Min Ho 4 May 1983 9 p Transl. into ENGLISH from Hangkong Zhishi (China), v. 141, no. 12, Dec. 1982 p 8-9
(AD-A129399; FTD-ID(RS)T-0337-83) Avail: NTIS HC A02/MF A01 CSCL 14/5

The lens of the CCD camera forms an image of the object on the focal plane where the CCD element converts the optical signals into electrical signals. The signals are recorded on magnetic tape after they are processed. When it is desired to view the 'picture', the magnetic tape with the picture recorded on it is inserted into a special image-revealing equipment that is connected to an ordinary television set. The picture recorded on the magnetic tape can be thus viewed on the screen of the TV set. The pictures can be copied onto a microtape. GRA

N83-36444# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.
CONCEPTUAL DESIGN OF AN IMAGE RECORDING SYSTEM FOR THE COMPENSATED IMAGE SYSTEM Final Technical Report, Jan. - Aug. 1982
B. L. McGlamery and R. L. Ensminger Griffiss AFB, N.Y. RADC Feb. 1983 38 p
(Contract F30602-81-C-0199; ARPA Order 2646; AF Proj. 2646)
(AD-A129583; RADC-TR-83-38) Avail: NTIS HC A03/MF A01 CSCL 17/8

This report describes the conceptual design of an image recording system to replace the present data recording system used in the DARPA/RADC compensated imaging system. The difficulties encountered with the present system are analyzed and a system which will overcome these difficulties is proposed. The system proposed will record in digital form up to 600 512 x 512 images at a rate of one per second. The stored images are available for immediate review and subsequent computer enhancement. Author (GRA)

N83-36445# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
SCINTILLATION COUNTING: AN EXTRAPOLATION INTO THE FUTURE
H. H. Ross 1983 14 p refs Presented at the Adv. in Scintillator Counting Conf., Banff, Alberta, 15 May 1983
(Contract W-7405-eng-26)
(DE83-012654; CONF-830565-4) Avail: NTIS HC A02/MF A01

Progress in scintillation counting which is related to advances in a variety of other disciplines such as photochemistry, photophysics, and instrumentation are discussed. The exponential growth of this technology has a profound effect on the art of scintillation spectroscopy. Key events in technology that have had an impact on the development of scintillation science (solid and liquid) are reviewed and extrapolation of future directions based on existing and projected capability in associated fields are outlined. Occassional pitfalls and several false starts are discussed as a reminer that if you want the future to be different than the past, study the past. DOE

N83-36446# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
LIQUID-HELIUM SCINTILLATION DETECTION WITH GERMANIUM PHOTODIODES
Paul N. Luke, E. E. Haller, and Herbert M. Steiner May 1982 5 p refs Presented at the IEEE Nucl. Sci. Symp., Washington, D.C., 20-22 Oct. 1982
(Contract DE-AC03-76SF-00098)
(DE83-013510; LBL-14459; CONF-821011-51) Avail: NTIS HC A02/MF A01

Special high purity germanium photodiodes were developed for the direct detection of vacuum ultraviolet scintillations in liquid helium. The photodiodes are immersed in the liquid helium, and scintillations are detected through one of the bare sides of the photodiodes. Test results with scintillation photons produced by 5.3-MeV (-) particles are presented. It is suggested that the use of these photodiodes as liquid helium scintillation detectors may offer substantial improvements over the alternate detection method requiring the use of wavelength shifters and photomultiplier tubes. DOE

N83-36447# California Univ., Berkeley. Lawrence Berkeley Lab. Solar Energy Group.
HOLOGRAPHIC WINDOW COATINGS FOR SOLAR CONTROL AND DAYLIGHTING: ASSESSMENT REPORT
Arlon J. Hunt Nov. 1982 28 p refs
(Contract DE-AC03-76SF-00098)
(DE83-014797; LBL-15305) Avail: NTIS HC A03/MF A01

Control of sunlight passing through windows based on the diffraction of light is investigated. In this approach, holographic

optical elements (HOE's) intercept sunlight and diffract it in a desired direction. As a window coating that may be applied to an existing structure, a HOE can provide angular acceptance or rejection of the incoming sunlight, can direct sunlight deeply into a room to provide task lighting, and can select the portion of sunlight with the greatest visual efficacy. Possible uses include daylighting, sunlight control and rejection, and solar heating. DOE

N83-36448# Los Alamos Scientific Lab., N. Mex.
SURFACE-SPARK DISCHARGES COMPARED WITH EXPLODING WIRES/FILMS AS HIGH TEMPERATURE UV SOURCES
K. D. Ware, T. M. Johnson, and C. R. Jones 1983 5 p refs Presented at the IEEE Power Electronics Specialist Conf., Albuquerque, N. Mex., 6-8 Jun. 1983
(Contract W-7405-eng-36)
(DE83-014199; LA-UR-83-1572; CONF-830621-31) Avail: NTIS HC A02/MF A01

The electrically exploded 0.05 to 0.25 mm diameter metal wires and film thicknesses from 0.1 to 10 (SIGMA) m were studied for lengths from 3.0 to 100 cm. These exploded metal conductor initiated discharges proved to be sources for intense radiation in the near ultraviolet range, 200 to 300 nm, with brightness temperatures measured over 40,000 K. The impedance matching characteristics and scaling laws developed through these studies are presented and compared with more recent results on surface spark discharges. These latter discharges do not appear to be as nearly blackbody as the conductor initiated discharges, but through selected insulator surfaces, intense emission in the spectral range of interest can be obtained. DOE

N83-36449# Los Alamos Scientific Lab., N. Mex. Chemistry Div.
INFRARED EMISSION SPECTRA OR URANIUM AND THORIUM
B. A. Palmer, M. V. Phillips, and R. Engleman, Jr. 1983 5 p refs Presented at the Soc. of Photo-Optical Instrumentation Engr. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014193; LA-UR-83-1685; CONF-830425-24) Avail: NTIS HC A02/MF A01

The region between 1 and 5.5 (SIGMA)m was observed with a high resolution Fourier transform spectrometer. See through hollow cathode lamps with calcium fluoride windows were operated at high current. Special precautions were required to minimize interference by blackbody radiation from the hot cathode. Observed lines were measured to an absolute accuracy of about 0.001 cm(+1) and about 5% relative intensity accuracy. The argon carrier gas lines were readily distinguished by their much wider Doppler broadened linewidths. Many lines were assigned to neutral or singly ionized thorium on the basis of predicted transition wavenumbers calculated from accurate level lists. However, many lines remain to be assigned. This new spectral data connects to, and extends similar, spectral information given in uranium and thorium atlases which cover the ultraviolet and visible regions. DOE

N83-36450# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
FAST, SELF-NULLING SPECTROSCOPIC ELLIPSOMETER: INSTRUMENTATION AND APPLICATION
Rolf H. Muller and Joseph C. Farmer May 1983 31 p refs
(Contract DE-AC03-76SF-00098)
(DE83-015015; LBL-15918) Avail: NTIS HC A03/MF A01

The advantages of rapid spectral scanning were combined with the inherent accuracy of a compensating ellipsometer operated in the polarizer compensator sample analyzer configuration. Wavelength is varied over the visible-UV at a maximum rate of 114 nm/s by rotating a continuously variable interference filter. A three reflection Fresnel rhomb serves as the achromatic quarter wave compensator. A microcomputer is used to collect spectroscopic measurements, perform instrument calibrations, digital filtering and interpret data. Wavelength independent parameters of multiple film optical models were determined by treating measurements of delta and psi at different wavelengths as independent measurements. Experimental and predicted ellipsometer measurements are compared by use of statistical techniques for the determination of optimum values and confidence limits of model parameters. DOE

N83-36451# Swedish Inst. for Materials Testing, Boras. Div. of Heating and Ventilation.
PRINCIPLES OF FLUID VOLUME METERS EQUIPPED WITH ELECTRONIC DEVICES
Per Fahlen 1983 36 p
(PB83-213801; SP-RAPP-1983-07; ISSN-0280-2503) Avail: NTIS HC A03/MF A01 CSCL 14B

A popular presentation of the principles of flow measuring systems is presented and the impact of modern electronic circuitry on these devices is discussed. Focus is on four different principles of flow meters: electromagnetic meters, vortexmeters, orbimeters and turbinemeters. Possible ways of signal conditioning and signal processing are considered with reference to microprocessor equipped systems. GRA

N83-36452# Council for Mineral Technology, Randburg (South Africa).
DEVELOPMENT OF AN AUTOMATIC SAMPLE-CHANGER AND CONTROL INSTRUMENTATION FOR ISOTOPE-SOURCE NEUTRON-ACTIVATION ANALYSIS
Arie Hugo Andeweg and John Ivor William 15 Mar. 1983 41 p
(PB83-221408; MINTEK-M53; ISBN-0-86999-591) Avail: NTIS HC A03/MF A01 CSCL 14B

An automatic sample-changer was developed which can transfer a sample of up to 3kg in mass over a distance of 3m within 5s. In addition, instrumentation in the form of a three-stage sequential timer was developed to control the sequence of irradiation transfer and analysis. GRA

N83-36453# National Center for Devices and Radiological Health, Rockville, Md.
A MICROPROCESSOR CONTROLLED INSTRUMENT FOR MEASUREMENT AND DISPLAY OF X-RAY WAVEFORMS Final Report
Thomas R. Lee Apr. 1983 52 p refs
(PB83-215509; HHS/PUB/FDA-83-8202; FDA/NCDRH-83/37) Avail: NTIS HC A04/MF A01 CSCL 06J

The National Center for Devices and Radiological Health has developed a radiation measurement instrument for use by Food and Drug Administration personnel in determining compliance of X-ray machines with applicable performance standards. The instrument measures radiation exposures from 1 mR to 590 R and exposure times from 1 msec to 5.76 seconds. It is compact, lightweight and battery powered, and suitable for field use. GRA

N83-36454# California Univ., San Diego, La Jolla. Dept. of Chemistry.
PREPARATION AND EVALUATION OF SELF-REGENERATIVE CARBON MONOXIDE DETECTION GELS Open File Report, 1 Sep. 1979 - 30 Jun. 1981
John G. Palmer, Michelle Cecil, Gerhard N. Schrauzer, and Kurt E. Shuler Sep. 1982 52 p refs
(Contract DI-BM-J0-188159)
(PB83-205179; BM-OFR-93-83) Avail: NTIS HC A04/MF A01 CSCL 14B

Continued development of an especially impregnated silica gel capable of reversible chemical detection of carbon monoxide was reported. The effects of changes in mine related ambient conditions on the detection catalyst's response were explored. Temperature, humidity, and several interfering gases were found to affect the detection catalyst. The interferents include hydrogen sulfide, nitrogen dioxide, acetylene (and methylacetylene), and ammonia. High humnidity decreased the detection catalyst's sensitivity to carbon monoxide for some formulations. Increasing temperature generally decreased the reaction time of the detection catalyst with carbon monoxide. A limited physical, chemical, and mechanistic characterization of the detection catalyst and the materials used to prepare it has been carried out. Metal component ratio

studies, spectral, analytical, pH, and rate measurements were done. GRA

N83-36455# National Bureau of Standards, Washington, D.C.
EXTENSION OF A REFERENCE SPECTROPHOTOMETER INTO THE NEAR INFRARED Final Report
Kenneth L. Eckerle, Victor R. Weidner, Jack J. Hsia, and Zu Wen Chao Apr. 1983 36 p refs
(PB83-207084; NBS-TN-1175) Avail: NTIS HC A03/MF A01 CSCL 14B

The purpose of this paper is to document adaptation of an existing reference spectrophotometer to the near infrared. Its previous wavelength range was from approximately 200 to 800 nm. The present adaptation increases its wavelength range to 2500 nm. The hardware and software necessary to achieve this were implemented along with tests necessary to characterize the instrument when it is operated in the near infrared (800 to 2500 nm). The accuracy of the transmittance measurements ranges from approximately 0.0002 to 0.012 transmittance units depending on instrument configuration, wavelength, and the sample itself, incedental to the success of this work was conversion for a dedicated microcomputer with interface boards. Many of the latter were designed at NBS. GRA

N83-36456# Southwest Research Inst., San Antonio, Tex.
EVALUATION OF PROXIMITY DEVICES, VOLUME 2, PHASE 3 Open File Report, 29 Sep. 1978 - 31 Dec. 1982
J. H. Nixon, J. E. Hipp, T. C. Green, G. H. Murch, and J. P. Cater 31 Dec. 1982 312 p refs
(Contract DI-BM-J0-88082)
(PB83-210278; BM-OFR-100(2)-83) Avail: NTIS HC A14/MF A01 CSCL 14B

Phase 1 of this three phase program consisted of test evaluations of commercially available proximity warning devices. Phase 2 resulted in the design and development of a microprocessor based distributed sensor ac electrometer that measures the electrostatic field at locations along a crane boom. In volume 1 of phase 2 the electrostatic fields around a crane boom were measured by the instrument at high voltage powerlnes of various voltages and geometries. Volume 2 of phase 2 contains the appendixes. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N83-36457*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ROLE OF SATELLITE LASER RANGING THROUGH THE 1990'S
D. C. Christodoulidis and D. E. Smith Sep. 1983 27 p Presented at the 17th Gen. Assembly Intern. Union of Geodesy and Geophys., Hamburg, Aug. 1983
(NASA-TM-85104; NAS 1.15:85104) Avail: NTIS HC A03/MF A01 CSCL 20E

Contributions of Satellite Laser Ranging (SLR) in the fields of geodesy, oceanography, geodynamics, and geopotential are reviewed. With the best current systems SLR has successfully defined an absolute vertical datum to 3 cm and a relative horizontal datum with comparable accuracy. In the areas of Earth and space physics SLR has demonstrated its ability to provide information regarding the vertical and horizontal movements of the lithosphere, the rheology of the Earth, improved understanding of the evolution of the Earth-Moon system, the Earth's albedo and upper atmosphere, the polar wander, the frequency structure of the polar motion and in the definition of fundamental constants. Future options are discussed. It is indicated that SLR will continue to provide a unique and powerful tool for the study of space and geosciences. J.M.S.

N83-36458# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MULTIPURPOSE SEMICONDUCTOR LASER EQUIPMENT
Zhou Fanming, Fan Jinsheng, and Wang Deyuan 6 Apr. 1983 16 p Transl. into ENGLISH from Dianzi Jishu (China), no. 7, 1982 p 41-43
(AD-A128274; FTD-ID(RS)T-1746-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

The light source of multipurpose semiconductor laser equipment uses the homogeneous knot or single heterogeneous knot GaAlAs/GaAs semiconductor lasers, which possess not only high antinoise capability, good security, long distance transmission, and low electricity consumption, its controller can also be utilized for alarming, switching, counting, etc. Author

N83-36459# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
ELECTRON ORBITS IN A FREE ELECTRON LASER WITH A LONGITUDINAL MAGNETIC WIGGLER
R. E. Aamodt Mar. 1983 18 p refs
(Contract N00014-79-C-0555)
(AD-A129004; SAI-254-83-416-LJ; PRI-60) Avail: NTIS HC A02/MF A01 CSCL 20/8

In studies of free electron lasers (FEL) systems, in which emission gain is induced through wiggler magnetic field modulation of the electron motion, detailed knowledge of the electron orbits is necessary in order to evaluate the critical features of the amplification scheme. These features include evaluating the frequency range for amplification, gain, rates, saturation mechanisms, and amplifying efficiencies. However, there exist very few magnetic geometries where the electron motion, even in the vacuum fields, can be obtained analytically with sufficient information to assess these critical features. Only recently has it been realized that in the on axis approximation the helical wiggler orbit problem can be reduced to quadrature, and that particular discovery has already led to significant progress in FEL amplification schemes. For FEL systems with strong magnetic guide fields, little or no insightful progress has been made except for this helical case. However, for just this class of magnetic systems, i.e. strong guide fields with a relatively low amplitude magnetic wiggler superimposed, an asymptotic mathematical formalism does exist where the electron equations of motion in the vacuum fields can be greatly simplified, and typically reduced to quadrature in parameter regimes of relevance to applications. GRA

N83-36460# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
SYSTEM FOR LASER SPOT PROFILE ANALYSIS Interim Report, Oct. 1981 - Sep. 1982
Eugene C. Crittenden, Jr. and Edmund A. Milne May 1983 23 p refs Sponsored in part by the Dept. of the Army
(Contract MIPR-TO-27-82)
(AD-A128968; NPS61-83-007) Avail: NTIS HC A02/MF A01 CSCL 20/5

A system for laser spot profile analysis has been developed and tested, and field test experiments proposed for the evaluation of laser designator performance. Silicon television tube cameras are used to determine the OTF of the atmosphere and to view the laser designator spot. Fourier transform computer techniques are then used to separate the effects of the atmosphere from the effects of laser instability and platform motion. Author (GRA)

N83-36461# University of Southern California, Los Angeles. Dept. of Chemistry.
A LASER PRODUCED PLASMA AS A PULSED SOURCE OF CONTINUUM INFRARED RADIATION FOR TIME RESOLVED ABSORPTION SPECTROSCOPY
Arthur W. Adamson and Marc C. Cimolino 1 Jun. 1983 20 p refs Submitted for publication
(Contract N00014-76-C-0548; NR Proj. 051-609)
(AD-A129123; TR-19) Avail: NTIS HC A02/MF A01 CSCL 07/4

The focussed beam from the 20 ns pulse of an amplified Nd glass laser produces a high temperature plasma in air or other media. Such plasmas, while well known as phenomena, seem not

to have been investigated as a source of infrared radiation. We find the emission in the chemical infrared region, 2100-1700/CM, to be a continuum or white, and at least twenty five times more intense than that from a typical glow bar used in conventional infrared absorption spectroscopy. Emission from the plasma formed in air decays with a wavelength dependent lifetime, about 150 ns for the visible portion, and 2 microsecond for the infrared portion. When formed in argon, the plasma emission is more intense, and the decay time of the infrared emission rises to 4 microsec. Use of this source is demonstrated in a measurement of the carbonyl stretching absorption for W(C0)6 and plans are to apply the method to the determination of infrared absorption spectra of thermally equilibrated excited states of organic molecules and of coordination compounds. GRA

N83-36462# FMC Corp., Minneapolis, Minn. Northern Ordnance Div.
LASER MEASURING SYSTEM FOR LARGE MACHINE TOOLS Final Report
Lloyd E. Wessel and Dan Brazys Aug. 1982 90 p refs Prepared in cooperation with Naval Ordnance Station, Louisville, Ky.
(Contract N00197-79-C-0095)
(AD-A128718; NAVSEA-MT-S-658-78; NAVSEA-MTP-134) Avail: NTIS HC A05/MF A01 CSCL 20/5

With development of the Laser Interferometer, it was envisioned that older existing machine tools could be up-graded by retrofitting them with laser Interferometer Measuring Systems. The Laser Interferometer provides the machine tool industry with a high accuracy length standard. The accuracy of the Interferometer is determined by the laser wave length which is known within 0.5 parts per million. This degree of accuracy is more than adequate for most machine tool measuring, calibration and inspection requirements. In conclusion, the Laser Measuring System presently available is not recommended for general implementation at this time. Results of this work indicate that the equipment and installation cost are very high and pay back would be very slow. Also, the reliability of the electronic components is in need of improvement. The system requires frequent realignment and maintenance due to it's lack of toleration to 'Shop Floor' conditions. Author (GRA)

N83-36463# Cornell Univ., Ithaca, N.Y.
EXCITRON-LASER AMPLIFIER Interim Technical Report
Richard L. Liboff and K. C. Liu 1 Dec. 1982 9 p refs
(Grant AF-AFOSR-3574-78; AF Proj. 2301)
(AD-A130036; AFOSR-83-0544TR; R4-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

A laser-amplifying device is described which is based on the stimulated decay of excitons in a pure crystal. An estimate is made of the gain of the device. At a typical frequency the gain is found to be appreciably large thus suggesting practical application of the laser amplifier. Author (GRA)

N83-36464# IBM Research Lab., San Jose, Calif. Dept. K46.
PULSED OPTO-ACOUSTICS: THEORY AND APPLICATIONS
A. C. Tam and H. Coufal 16 Jun. 1983 17 p refs Submitted for publication
(Contract N00014-83-C-0170; NR Proj. 633-844)
(AD-A130153; TR-2) Avail: NTIS HC A02/MF A01 CSCL 20/5

An overview of the technique of pulsed opto-acoustics, whereby an excitation beam of short pulse-duration and low duty cycle is used to generate acoustic transients which are detected by contract as well as non-contact acoustic detection techniques is presented. Theories of pulsed opto-acoustic generation depending on the source dimensions for the simple case of weak optical absorptions are discussed. Various methods of acoustic detection involving piezoelectric ceramics, thin films, or optical beams are reviewed. Applications discussed include monitoring weak absorptions in highly transparent materials or in trace detection, acoustic materials testing utilizing either contact or non-contact detection methods, and the generation of very high pressure transients. Author

N83-36465# Litton Systems, Inc., Morris Plains, N. J. Airtron Div.
PREPARATION OF RARE EARTH DOPED LASER MATERIALS Final Report, 1 Oct. 1981 - 1 Oct. 1982
Roger F. Belt and Robert Uhrin Dec. 1982 38 p refs
(Contract N00014-81-C-0656; NR Proj. 379-050)
(AD-A129777) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report describes the single crystal growth of various laser materials which may be useful in generating new wavelengths. It also includes some compositions of materials which are not available commercially but are necessary for test lasers at the Naval Research Laboratory. The host crystals include yttrium aluminum garnet (Y2A14012), yttrium lithium fluorides (YLiF4), and barium yttrium fluoride (BaY2F8). These hosts were doped with single or multiple rare earth elements for lasing action at wavelengths in the near infrared (1-3 micrometers). After the crystals were grown, samples were provided in the form of cm size polished rectangular parallepipeds or 5-6 cm cylindrical rods with polished ends. All of the samples were tested or used at laser facilities of the Naval Research Laboratory. No active tests were performed at the crystal preparation source. GRA

N83-36466# Cornell Univ., Ithaca, N.Y.
STUDY OF A NUCLEAR GAMMA-RAY LASER Interim Technical Report
Richard L. Liboff, Daniel M. Heffernan, and Barukh Yaakobi 3 Jun. 1983 16 p refs
(Grant AF-AFOSR-3574-78; AF Proj. 2301)
(AD-A129571; AFOSR-83-0527TR; R-3-83) Avail: NTIS HC A02/MF A01 CSCL 20/6

In this analysis we describe briefly a possible approach to the realization of a gamma-ray laser ('graser') 1.2. The proposed scheme has its basis in certain long-lived excited states among the heavier nuclei. Decay of such states, for the most part, gives rise to high-order multipole radiation. These excited states are populated through either beta-decay or electron capture. The device presumes that a collection of such long-lived excited states is unstable to induced resonant emission. Decay of parent nuclei serve as the pumping mechanism in the proposed lasing scheme. Author (GRA)

N83-36467# National Bureau of Standards, Washington, D.C. National Engineering Lab.
THERMAL RADIATIVE IGNITION OF LIQUID FUELS BY A CO2 LASER Final Progress Report, 1 Oct. 1979 - 30 Sep. 1982
Takashi Kashiwagi, Thomas J. Ohlemiller, Thomas Kashiwagi, and Walter W. Jones May 1983 80 p refs
(Grant AF-AFOSR-ISSA-0014-82)
(AD-A129250; PB83-213470; NBSIR-83-2689) Avail: NTIS HC A05/MF A01 CSCL 20/5

This report summarizes progress in the study of the ignition mechanism of a liquid fuel by a CW CO2 laser; the period covered is from October 1, 1979 to September 30, 1982. It describes (1) new observations of liquid fuel behavior near and at the liquid/air interface during the laser irradiation with incident fluxes from 260 to 2500 W/cm2, (2) new time-resolved measurements of temperature and vapor concentration distributions in the gas phase using a newly-developed, high speed, two-wavelength holographic interferometer, and (3) the development of a technique to measure infrared absorption spectra of fuel vapors at elevated temperatures. Author (GRA)

N83-36468# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
HIGH EXTRACTION FREE-ELECTRON LASER EXPERIMENTS
29 Mar. 1983 50 p refs
(Contract N00014-82-C-0704)
(AD-A129479; MSNW-C.11.240) Avail: NTIS HC A03/MF A01 CSCL 20/5

During this reporting period a tappered-wiggler free-electron laser experiment has been constructed and initial energy extraction measurements have been made. The intent of the experiment is to demonstrate the high extraction capability of the tappered-

wiggler free-electron laser. The hardware involves three primary elements: a two meter Sm Co5 permanent magnet wiggler, an RF linac operating at 20 MEV, and a 500 megawatt pulsed CO2 laser. The FEL is operated in an amplifier configuration, with the electron and laser beams making a single simultaneous pass through the wiggler. The interaction of these beams is monitored by comparison of the electron energy spectrum with and without the presence of the CO2 laser. The spectrum measurements are made using a round pole electron spectrometer. The wiggler wavelength is tappered such that the exit resonant energy is 9 percent below that at the entrance. The extraction measurements show that some electrons do decelerate 9 percent, in accordance with the taper, and that the net extraction is 2.5 percent. Extraction of 4 percent is expected when the overlap between electron and photon beams is improved. Author (GRA)

N83-36469# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NO. 53, MARCH - APRIL 1982
May 1983 146 p
(AD-A129467; DIA-DST-2700Z-004-83) Avail: NTIS HC A07/MF A01 CSCL 05/2

This is the Soviet Laser Bibliography for March-April 1982, and is No. 58 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. Author (GRA)

N83-36470# Cornell Univ., Ithaca, N.Y. Dept. of Physics.
KINETIC THEORY Annual Technical Report, Mar. 1982 - Feb. 1983
Richard L. Liboff 27 Apr. 1983 9 p
(Grant AF-AFOSR-3574-78; AF Proj. 2301)
(AD-A129437; AFOSR-83-0497TR; R-2-82) Avail: NTIS HC A02/MF A01 CSCL 20/11

A review of work performed under contract AFOSR 78-3574 during the '82- '83 support interval is presented. A list of titles and abstracts of technical reports issued during this period is included. A brief summary is presented of lectures delivered at the University of California on contractual research. The report concludes with a description of ongoing research. Author (GRA)

N83-36471# Sandia Labs., Albuquerque, N. Mex.
ANALYSIS OF LASER DESORPTION BY SECONDARY-ION MASS SPECTROMETRY
Alan R. Burns 1983 12 p refs Presented at the Soc. of Photo-Opt. Instrumentation Engr. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012621; SAND-82-2698C; CONF-830425-20) Avail: NTIS HC A02/MF A01

Laser induced thermal desorption with secondary ion mass spectroscopy (SIMS) was examined. The desorption of small molecules on a polycrystalling tungsten surface by high intensity 1064 nm pulses of 8 to 10 nsec duration is analyzed by monitoring relative changes in the SIMS intensities. Despite the very high surface temperatures (30000K) obtained by the adsorption of intense laser radiation, the observed changes are much smaller than predicted by the equilibrium model of thermal desorption. DOE

N83-36472# Los Alamos Scientific Lab., N. Mex.
SPOTSIZE EFFECTS IN LASER DAMAGE TESTING
S. R. Foltyn 1982 12 p refs Presented at the Conf. on Laser Induced Damage in Opt. Mater., Boulder, Colo., 15-17 Nov. 1982
(Contract W-7405-eng-36)
(DE83-012681; LA-UR-83-1020; CONF-821170-4;) Avail: NTIS HC A02/MF A01

An unconventional method was employed to plot damage data: ten sites are irradiated at each test fluence and the fraction of damaging sites is plotted as a function of peak fluence. The resulting curves slope from a fluence at which no damage was produced to a higher fluence at which all ten sites were damaged. Attempts to explain wide slope variations among a variety of tested samples have led to a simple model which correlates slope, defect density, and Gaussian spotsize of the test beam. Specifically, the model predicts steep slopes if the beam is large compared to the mean defect spacing. In contract to conventional notation, threshold is defined as the highest fluence at which the sample could not be damaged. Implicit in the model is that threshold thus defined is independent of spotsize while conventional thresholds have a calculable dependence. In the limit of large spotsize, the two thresholds are identical. Test results for various spotsizes are reported and analyses of published experimental data are presented in support of this model. DOE

N83-36473# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
PULSED CHEMICAL LASER WITH VARIABLE-PULSE-LENGTH ELECTRON-BEAM INITIATION AND MAGNETIC CONFINEMENT Technical Report, Nov. 1979 - Apr. 1980
S. T. Animoto, J. S. Whittier, M. L. Lundquist, F. G. Ronkowski, and R. Hofland 25 Apr. 1983 16 p refs
(Contract F040701-82-C-0083)
(AD-A129527; TR-0083(3606)-1; SD-TR-83-28) Avail: NTIS HC A02/MF A01 CSCL 20/5

The performance of a pulsed HF (DF) chain laser was investigated for the case of transverse initiation by a magnetically confined electron beam. Laser energy and beam quality are presented as functions of electron-gun, magnetic field, gas mixture, and optical resonator parameters; results include 79 s/liter HF laser output and electrical efficiency for conversion of total incident electron-beam energy to laser output energy of 45%. Author (GRA)

N83-36474# California Univ., Livermore. Lawrence Livermore Lab.
USES OF ORACLE IN THE NOVA LASER CONTROL SYSTEM
D. L. McGuigan 22 Jun. 1983 11 p Presented at the 2d Intern. ORACLE User Group Conf., Boston, 15-17 Aug. 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE83-014947; UCRL-89016; CONF-830883-2) Avail: NTIS HC A02/MF A01

The Nova Laser System is a large scale fusion experiment which is now under ion. Modern control system technology is required to efficiently manage the thousands of devices needed to operate the system. To reduce the requirements on the operations staff, much of the system is automated which requires a significant knowledge base including frequently used system configurations and device parameters. The ORACLE will be used to provide this information to the control system. To insure the control system integrity, ORACLE will be used to maintain informaton about the control system software. This information will be used to document the system and help track down problems. The ORACLE will also be used to maintain data on the system performane. This data will be analyzed to optimize the laser performance and to point out when maintenance is required. DOE

N83-36475# California Univ., Livermore. Lawrence Livermore Lab.
USE OF ORACLE IN A SCIENTIFIC ENVIRONMENT
R. W. Carey, J. M. Auerbach, R. A. Lerche, and B. J. Demartini 1983 8 p refs Presented at the 2nd Intern. ORACLE User Group Conf., Boston, 14-17 Aug. 1983
(Contract W-7405-eng-48)
(DE83-014952; UCRL-89396; CONF-830883-1) Avail: NTIS HC A02/MF A01

The use of ORACLE was discussed. The mission of this VAX based computing facility is to aid laser program scientists and engineers develop their understanding of inertial confinement fusion target behavior. The ORACLE DBMS as a major part of an integrated data management and analysis environment for accomplishing this task are incoroprated. The use of ORACLE through all phases of data processing from raw digital forms to final physics summary data is discussed. Applications include: an information management tool for maintaining large amounts of one and two dimensional data, a configuration management tool for experiment setup information, and a data analysis tool for maintaining calibration and sensor response data. DOE

N83-36476# Rochester Univ., N. Y. Lab. for Laser Energetics.
MONOLITHIC CELL FOR FREQUENCY CONVERSION
R. Bossert, S. D. Jacobs, and L. Lund Mar. 1983 13 p refs
(Contract DE-AC08-80DP-40124)
(DE83-015346; DOE/EP-40124/7) Avail: NTIS HC A02/MF A01

The design, assembly, and operation of a single cell for frequency conversion of Nd:glass laser radiation from lambda = 1054 nm to lambda = 351 nm is reported. The highly energy efficient polarization mismatch scheme was combined with the simplicity of the tandem crystal approach. The resultant monolithic conversion cell consists of two KDP Type 2 crystals, assembled with tuning axes orthogonal and contained between a single pair of windows. An index-matching liquid is used to eliminate reflections from all internal surfaces. A simple birefringence-sensitive method for marking and orienting circular doubler and mixer crystals with tuning axes orthogonal to better than 60 seconds of arc is described. The monolithic cell design is described, with emphasis on the chemical compatibility of component materials (crystals, spacers, seals, and metal surfaces) with index-matching liquids. A comparison between Halocarbon and Koolase index-matching fluids, after several months of operation (greater than 400 shots), shows the latter to exhibit better long term, photochemical stability. The performance of the monolithic cell is superior to that of separate doubler and mixer cells. It exhibits better long term pointing stability and produces a cleaner 3 (NU) beam. DOE

N83-36477# Los Alamos Scientific Lab., N. Mex.
TRANSIENT EFFECTS AND PUMP DEPLETION IN STIMULATED RAMAN SCATTERING
J. L. Carlsten, R. G. Wenzel, and K. Druehl 1983 8 p refs Presented at the Soc. of Photo-Opt. Instr. Engr. Conf., Santa Fe, N. Mex., 11-15 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014139; LA-UR-83-1851; CONF-830425-32) Avail: NTIS HC A02/MF A01

Stimulated rotational Raman scattering in a 300-K multipass cell filled with para H2 with a single mode CO2 pumped laser was studied by a frequency narrowed optical parametric oscillator (OPO) as a probe laser at the Stokes frequency for the S0(O) transition. Amplification and pump depletion are examined as a function of incident pump energy. The pump depletion shows clear evidence of transient behavior. A theoretical treatment of transient stimulated Raman scattering, including effects of both pump depletion and medium saturation is presented. In a first approximation, diffraction effects are neglected, and only plane wave interactions are considered. DOE

N83-36478# Los Alamos Scientific Lab., N. Mex.
ANTARES REFERENCE TELESCOPE SYSTEM
V. K. Viswanathan, E. Kaprelian (Questar Corp., New Hope, Pa.), T. Swann, J. Parker, P. Wolfe, G. Woodfin, and D. Knight (Questar Corp., New Hope, Pa.) 1983 12 p refs Presented at the Los Alamos Conf. on Optics '83, Santa Fe, N. Mex., 11-15 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014178; LA-UR-83-1666) Avail: NTIS HC A02/MF A01

Antares is a 24 beam, 40 TW carbon dioxide laser fusion system currently nearing completion. The 24 beams will be focused onto a tiny target. It is to position the targets to within 10 (SIGMA)m of a selected nominal position, which may be anywhere within a fixed spherical region 1 cm in diameter. The Antares reference telescope system is intended to help achieve this goal for alignment and viewing of the various targets used in the laser system. The Antares reference telescope system consists of two similar electrooptical systems positioned in a near orthogonal manner in the target chamber area of the laser. Each of these consists of four subsystems: (1) a fixed 9% optical imaging subsystem which produces an image of the target at the vidicon; (2) a reticle projection subsystem which superimposes an image of the reticle pattern at the vidicon; (3) an adjustable front lighting subsystem which illuminates the target; and (4) an adjustable back lighting subsystem which also can be used to illuminate the target. The various optical, mechanical, and vidicon design considerations and tradeoffs are discussed. The final system chosen and its current status are described. DOE

N83-36479# Los Alamos Scientific Lab., N. Mex.
TECHNIQUE USING AXICONS FOR GENERATING FLAT-TOP LASER-BEAM PROFILES
V. K. Viswanathan, G. L. Woodfin, D. Stahl, J. P. Carpenter, and G. Kyrala 1983 8 p refs Presented at the Soc. of Photo-Optical Instrumentation Engr. Conf., Santa Fe, N. Mex., 11-15 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014177; LA-UR-83-1665; CONF-830425-28) Avail: NTIS HC A02/MF A01

A number of schemes to achieve a large focal spot with desired characteristics are described. It is found that Axicons produce spots with desired characteristics. Axicons are lenses or mirrors with a cone shaped surface. The various schemes and an experiment in Helios which confirmed that axicons produced the spots with desirable characteristics are described. Helios is an 8 beam CO2 laser which produces 10 KJ at power in excess of 20 TW. It is currently in use for laser fusion studies. DOE

N83-36480# Los Alamos Scientific Lab., N. Mex.
ANTARES IS COMING TO LIFE
Hansjorg Jansen 1983 7 p Presented at the IEEE Power Electronics Specialist Conf., Albuquerque, N. Mex., 6-8 Jun. 1983
(Contract W-7405-eng-36)
(DE83-014155; LA-UR-83-1592; CONF-830621-36) Avail: NTIS HC A02/MF A01

The basic design parameters of the laser fusion machine and the present status of the assembly and test activities are reviewed. Antares is designed to focus 24 laser beams of 1.7-TW each onto a target of submillimeter size. Two grid contolled electron guns and 96 laser cavities have to be energized by 10 powerful Marx generators in microseconds. During automatic alignment, 168 mirrors have to be moved. Laser energy is extracted in one nanosecond. Test results of the subsystems and of the first integrated beamline (12 beams) are discussed. DOE

N83-36481# Sandia Labs., Albuquerque, N. Mex.
DYNAMIC TRANSVERSE PARTICLE VELOCITY MEASUREMENTS USING INTERFERROMETRIC TECHNIQUES
L. C. Chhabildas 1983 14 p refs Presented at the 27th Ann. Intern. Tech. Symp. on High Speed Photography, Videography and Photonics, San Diego, Calif., 21 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013674; SAND-83-0921C; CONF-830874-1) Avail: NTIS HC A02/MF A01

An optical technique is described which uses velocity interferometry to determine the particle velocity changes associated with plane shear wave propagation. In this technique, two velocity interferometers are used to monitor different diffracted laser beams from a surface which undergoes both longitudinal and shear motion. Fringes produced in the interferometer are proportional to a linear combination of both the longitudinal and shear components of the free surface velocity. By obtaining two independent recordings of the motion, the two velocity components can be determined. Selected examples of shear wave interferometry applications are reported. DOE

N83-36664# Joint Publications Research Service, Arlington, Va.
LIGHT PENETRATION OF OPAQUE PHYSICAL AND BIOLOGI-

CAL MEDIUMS USING COMPRESSION
Gurgen Ashotovich Askaryan *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 43 (JPRS-84475) 5 Oct. 1983 p 47-56 refs Transl. into ENGLISH from Priroda (Moscow), no. 5, May 1983 p 72-78 (For primary document see N83-36662 24-51)
Avail: NTIS HC A05

N83-36845# Joint Publications Research Service, Arlington, Va.
DISCHARGE-PUMPED HIGH PULSE EXIMER LASER
A. Vill, T. Klementi, V. Mikhkelsoo, and V. Altukhov *In its* USSR Rept.: Phys. and Math., No. 85 (JPRS-84411) 26 Sep. 1983 p 6-12 refs Transl. into ENGLISH from Izv. Akad. Nauk Estonskoy SSR: Fiz. Mat. (Tallin), v. 32, no. 1, Jan. - Mar. 1983 p 109-113 (For primary document see N83-36844 24-70)
Avail: NTIS HC A03

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N83-36482* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APPARATUS FOR ACCURATELY PRELOADING AUGER ATTACHMENT MEANS FOR FRANGIBLE PROTECTIVE MATERIAL Patent
Alan M. Lovelace (Rockwell International Corp., Downey, Calif.) and Kenneth E. Wood, inventors (to NASA) (Rockwell International Corp., Downey, Calif.) Issued 4 Oct. 1983 6 p Filed 30 Mar. 1981 Supersedes N81-24446 (19 - 15, p 2063) Sponsored by NASA
(NASA-Case-MSC-18791-1; US-Patent-4,407,165; US-Patent-Appl-SN-248746; US-Patent-Class-73-862.54; US-Patent-Class-29-446; US-Patent-Class-81-55; US-Patent-Class-81-57.38) Avail: US Patent and Trademark Office CSCL 09I

Apparatus for preloading a spring loaded threaded member is described. The apparatus is formed of three telescoping tubes. The innermost tube has means to prevent rotation of the threaded member. The middle tube is threadedly engaged with the threaded member and by axial movement applies a preload thereto. The outer tube engages a nut which may be rotated to retain the threaded member in axial position to maintain the preload.
Official Gazette of the U.S. Patent and Trademark Office

N83-36483* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATIC COMPRESSION ADJUSTING MECHANISM FOR INTERNAL COMBUSTION ENGINES Patent
James W. Akkerman, inventor (to NASA) Issued 27 Sep. 1983 8 p Filed 22 May 1981 Supersedes N81-29442 (19 - 20, p 2773)
(NASA-Case-MSC-18807-1; US-Patent-4,406,256; US-Patent-Appl-SN-266688; US-Patent-Class-123-78E; US-Patent-Class-123-197R) Avail: US Patent and Trademark Office CSCL 21G

Means for controlling the compression pressure in an internal combustion engine having one or more cylinders and subject to widely varying power output requirements are provided. Received between each crank pin and connecting rod is an eccentric sleeve selectively capable of rotation about the crank pin and/or inside the rod and for latching with the rod to vary the effective length of the connecting rod and thereby the clearance volume of the engine. The eccentric normally rotates inside the connecting rod during the exhaust and intake strokes but a latching pawl carried by the eccentric is movable radially outwardly to latch the rod and eccentric together during the compression and power strokes. A control valve responds to intake manifold pressure to time the supply of hydraulic fluid to move the latch-pawl outwardly, varying the effective rod length to maintain a substantially optimum firing chamber pressure at all intake manifold pressures.
Official Gazette of the U.S. Patent and Trademark Office

N83-36484*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ROTARY STEPPING DEVICE WITH MEMORY METAL ACTUATOR Patent Application
Robert S. Jamieson, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 15 Jul. 1983 12 p
(Contract NAS7-100)
(NASA-Case-NPO-15482-1; US-Patent-Appl-SN-526739) Avail: NTIS HC A02/MF A01 CSCL 13I

A rotary stepping device includes a rotatable shaft which is driven by means of a coiled spring clutch which is alternately tightened to grip and rotate the shaft and released to return it to a resting position. An actuator formed of a memroy metal is used to pull the spring clutch to tighten it and rotate the shaft. The actuator is activated by heating it above its critical temperature and is returned to an elongated configuration by means of the force of the spring cloth. NASA

N83-36485*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MEMORY METAL ACTUATOR Patent Application
Carl F. Ruoff, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Aug. 1983 17 p
(Contract NAS7-100)
(NASA-Case-NPO-15960-1; NASA-Case-NPO-16120-1; US-Patent-Appl-SN-527613) Avail: NTIS HC A02/MF A01 CSCL 13I

A mechanical actuator can be constructed by employing a plurality of memory metal actuator elements in parallel to control the amount of actuating force. In order to facilitate direct control by digital control signals provided by a computer or the like, the actuating elements may vary in stiffness according to a binary relationship. The cooling or reset time of the actuator elements can be reduced by employing Peltier junction cooling assemblies in the actuator. NASA

N83-36486*# Texas A&M Univ., College Station. Turbomachinery Labs.
THE SSME HPFTP INTERSTAGE SEALS: ANALYSIS AND EXPERIMENTS FOR LEAKAGE AND REACTION-FORCE COEFFICIENTS Progress Report
Dara W. Childs 15 Feb. 1983 157 p refs
(Contract NAS8-33716)
(NASA-CR-170876; NAS 1.26:170876) Avail: NTIS HC A08/MF A01 CSCL 11A

An overview of the NASA Thunderstorm Overflight Program (TOP) being conducted by the Marshall Space Flight Center and university researchers in atmospheric electricity is presented. The various instruments flown on the NASA U-2 aircraft, as well as the ground instrumentation used in 1982 to collect optical and electronic signatures from the lightning events are discussed. Samples of some of the photographic and electronic signatures are presented. Approximately 6400 electronic data samples of optical pulses were collected. Author

N83-36487# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Applied Research Branch.
THE CRREL INSTRUMENTED VEHICLE: HARDWARE AND SOFTWARE
George L. Blaisdell Jan. 1983 80 p refs
(DA Proj. 4A7-62730-AT-42)
(AD-A128713; CRREL-SR-83-3) Avail: NTIS HC A05/MF A01 CSCL 13/6

This report gives a detailed description of the CRREL Instrumented Vehicle (CIV). The CIV is equipped with instrumentation to measure three mutually perpendicular forces acting at the interface between the front tires and any surface material. In addition, accurate wheel and vehicle speeds and rear axle torque are measured. The vehicle is equipped for front-wheel, rear-wheel or four-wheel drive. A dual brake system allows front-, rear- or

four-wheel braking. A minicomputer-based data acquisition system is installed in the vehicle to control data gathering and to process data. The software for data acquisition and manipulation and the interfacing techniques required are described. Author (GRA)

N83-36488# Mechanical Technology, Inc., Latham, N. Y.
DAMPER COMPONENT ANALYSIS AND INTEGRATION WITH ROTOR-DYNAMICS PROGRAM Interim Report, Oct. 1979 - Dec. 1981
Joseph A. Tecza, Edward S. Zorzi, and William H. Parker (Detroit Diesel Allison) Wright-Patterson AFB, Ohio AFWAL Nov. 1982 126 p refs
(Contract F33615-79-C-2050; AF Proj. 3066)
(AD-A129021; AFWAL-TR-82-2112; MTI-82TR61; IR-1) Avail: NTIS HC A07/MF A01 CSCL 09/5

Squeeze film dampers are widely used components in modern turbomachinery, but their behavior is not well understood. This program was initiated in order to extend the squeeze film damper analytical basis, confirm predictions by means of a test program, transfer the analytical technology to a gas turbine engine manufacturer, integrate it with existing rotordynamic tools and develop and demonstrate a damper design system. Author (GRA)

N83-36489# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 68.
A HIGH PRESSURE MERCURY TURBINE CYCLE FOR USE IN SPACECRAFT AND TERRESTRIAL POWER PLANTS
Robert M. Lerner 22 Mar. 1983 257 p refs
(Contract F19628-80-C-0002; AF Proj. 2029; AF Proj. 6430)
(AD-A129016; ESD-TR-82-176; TR-577) Avail: NTIS HC A12/MF A01 CSCL 13/2

A high pressure thermomechanical cycle using mercury as the working fluid can be made practical at close to theoretical thermodynamic efficiency between a hot shoe temperature of about 1200 K (3000 psia boiler pressure) and 600 K condenser. Means are proposed for utilizing a simple Rankine cycle without superheat, in which liquid droplets are vaporized by radiative heat transfer after being sprayed into the boiler chamber as a mist; and in which vapor wetness is controlled (by addition of further hot mist if need be) prior to expansion in a nozzle; and in which, after expansion, the kinetic energy of both droplet and vapor phases is utilized in a turbine. GRA

N83-36490# Coordinating Research Council, Inc., Atlanta, Ga. Light-Duty Vehicles Fuel, Lubricant, and Equipment Research Committee.
CARBURETOR CLEANLINESS TEST PROCEDURE STATE-OF-THE-ART REPORT Summary Report, 1973-1981
Apr. 1983 95 p
(Contract DAAK70-81-C-0128)
(AD-A130411; CRC-529) Avail: NTIS HC A05/MF A01 CSCL 13/9

The objective of the Carburetor Test Procedure Panel was to develop a viable laboratory engine test procedure for evaluating the effect of gasolines on the formation of deposits in the throttle body area of carburetors. GRA

N83-36491# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
FUSION WELDING RESEARCH Annual Technical Report, 15 Feb. 1982 - 14 Feb. 1983
T. W. Eagar, G. B. Hunter, G. J. Dunn, C. D. Sorensen, and A. Block-Holten 30 Apr. 1983 65 p refs
(Contract N00014-80-C-0384)
(AD-A129715) Avail: NTIS HC A04/MF A01 CSCL 13/8

This report summarizes progress during the third year of research on the physics of arc welding processes. Studies include vapor emission from weld pools, development of a high speed infrared temperature monitor, digital signal analysis of weld noise voltages, convection and surface depression of the weld pool, electroslag welding of titanium, pulsed current gas metal arc welding and fracture toughness of HY-80 weldments. Author (GRA)

N83-36492# Waters (Mark) and Associates, Inc., Sunnyvale, Calif.
GAS-TURBINE EVALUATION (GATE) COMPUTER PROGRAM: THERMODYNAMIC CYCLES, METHODS AND SAMPLE CASES Final Report
Feb. 1983 115 p refs Sponsored by EPRI
(EPRI Proj. 2052-1)
(DE83-901852; EPRI-AP-2871-CCM) Avail: NTIS HC A06/MF A01

A computer program to compute detailed power plant performance using the results of advanced turbine research was developed. The program is called gas turbine evaluation (GATE). The previous items are reported: the initial documentation of the program and different power plant cycle options, the engineering approach and methods used, and sample cases to demonstrate applications. The analysis involves the thermodynamics and gas dynamics of air vapor fuel mixtures, and the details of the flow in each stage of the turbine, including accurate calculation of cooling air requirements and stage efficiencies are emphasized. DOE

N83-36493# Curtiss-Wright Corp., Wood-Ridge, N.J.
HIGH TEMPERATURE TURBINE TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES Technical Progress Report, 1 Apr. - 30 Jun. 1982
Feb. 1983 32 p
(Contract DE-AC01-76ET-10348)
(DE83-008413; CW-WR-76-020.109) Avail: NTIS HC A03/MF A01

Work was initiated on the turbine vane aerodynamic cascade test program. The level of aerodynamic losses associated with a transpiration air cooled airfoil and with a solid, uncooled airfoil of identical profile was evaluated. The test plan includes testing both solid and TAC vanes at various pressure ratios, cooling air flows and cooling air temperature to primary flow ratios. Rework of the 600 cascade test rig to incorporate a modified combustor section upstream of the cascade vanes was completed. Pressure measurement instrumentation was installed on the solid and TAC vanes. Facility modifications and rework of existing equipment to fit the cascade test rig were both completed. Computer data acquisition and analysis calculation procedure programming were completed and checked out on the test stand. Work was initiated to develop a method by which the skin permeability of a TAC airfoil would be reduced to zero without altering the characteristic roughness of the skin. Extended time oxidation testing of Nichrome V-Cb material porous mesh for transpiration air cooled turbine airfoils is continuing. DOE

N83-36494# Curtiss-Wright Corp., Wood-Ridge, N.J.
HIGH TEMPERATURE TURBINE TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES Technical Progress Report, 1 Jul. - 30 Sep. 1982
Feb. 1983 44 p
(Contract DE-AC01-76ET-10348)
(DE83-008412; CW-WR-76-020.110; FE-2291-110) Avail: NTIS HC A03/MF A01

The level of aerodynamic losses associated with a transpiration air-cooled (TAC) airfoil and with a solid uncooled air foil of identical profile was evaluated. The test plan includes the test program for both solid and TAC vanes at various parameters as well as definition of the exact calculation procedure for analysis of data. Performance tests were conducted with the uncooled solid vane cascade rig at various pressure ratios and base pressure levels of 4 atms. Operational problems with overheating of the sweep probe actuator motors were resolved by increased insulation and air cooling of the probe housing from the 10000 F primary air flow. Analysis of the data and instrument calibration as well as repeatability confirmed the reliability of the test results. As a result, the cascade solid vane configuration was converted to TAC vanes for the next test phase. Aerodynamic performance testing with the TAC vane cascade configuration was conducted at various pressure ratios (primary and cooling), cooling flows and primary/coolant temperature ratios. DOE

N83-36495# Sandia Corp., Albuquerque, N. Mex.
MODAL IDENTIFICATION OF A ROTATING-BLADE SYSTEM
Thomas G. Carne, David R. Martinez, and Samir R. Ibrahim Apr. 1983 20 p refs
(Contract DE-AC04-76DP-00789)
(DE83-015631; SAND-82-2115) Avail: NTIS HC A02/MF A01

A new testing technique and the Ibrahim time domain (ITD) modal identification algorithm were combined, which resulted in a capability to estimate modal parameters for rotating blade systems. This capability was evaluated on the two meter, vertical axis wind turbine. Variation in modal frequencies as a function of rotation speed was determined from 0 rpm (parked) to 800 rpm. Excitation of the rotating turbine was provided by a scheme which suddenly released a pretensioned cable, thus plucking the turbine as it rotated. The structural response was obtained by passing the signals through slip rings. Using the measured free decay responses as input data for the ITD algorithms, the modes of the rotating turbine were determined at seven rotation speeds. The measured modal parameters were compared with analytical results obtained from a finite element analysis and with experimental results obtained from a complex exponential identification algorithm. DOE

N83-36496# California Univ., Livermore. Lawrence Livermore Lab.
USE OF FUSION-WELDING TECHNIQUES IN FABRICATION OF A SUPERCONDUCTING-MAGNET THERMAL-SHIELD SYSTEM
E. N. C. Dalder, J. H. Berkey, Y. Chang, G. L. Johnson, G. H. Lathrop, D. L. Podesta, and J. H. VanSant 10 Jun. 1983 34 p refs Presented at the 64th Ann. Am. Welding Soc. Meeting, Philadelphia, 25-29 Apr. 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE83-014869; UCRL-87700; CONF-830485-3) Avail: NTIS HC A03/MF A01

Success of the thermal shield system was demonstrated by the results of acceptance tests performed with the magnet and all its ancillary equipment. During these tests the thermal shield system was: (1) thermally cycled several times from 3000K to 770K; (2) pressure cycled several times from 0 to 5 atmospheres; (3) operated for more than 500 hours at 770K and in a vacuum environment of less than 10(+5) torr; (4) operated in a magnetic field up to 6.0 Telsa; (5) exposed to a rapidly collapsing magnetic field of more than 250 gauss per second; (6) drained of all LN2 in a few minutes, without any weld failures. The successful operation of the magnet system validates the choice of the welding processes used, and their execution in both shop and field environments. DOE

N83-36497# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.
INTERMEDIATE VELOCITY PENETRATION OF STEEL SPHERES INTO DEEP ALUMINUM TARGETS
T. G. Trucano and D. E. Grady 1983 5 p refs Presented at the American Physical Society Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-015205; SAND-83-0772C; CONF-830719-8) Avail: NTIS HC A02/MF A01

The effects and significance of adiabatic shear band formation in metal penetration phenomena were identified. Targets of 6061-T6 aluminum were impacted by hardened steel spheres at velocities varying from 0.6 to 1.2 km/s. The targets were large enough to be treated as infinite half spaces in subsequent analyses. Depth of penetration and target microstructure were observed after each experiment and compared with the results of quasistatic punch tests performed on identical targets. Shear bands were observed in the targets for the dynamic experiments, but were absent in the quasistatic tests. It is indicated that thermal softening and/or thermal shear localization does strongly influence the dynamic penetration process. DOE

N83-36498# Northern Research and Engineering Corp., Woburn, Mass.
R AND D FOR IMPROVED EFFICIENCY SMALL STEAM TURBINES, PHASES 1 AND 2 Final Technical Report
28 Feb. 1983 268 p refs
(Contract DE-AC03-79ET-15426)
(DE83-013483; DOE/ET-15426/T25) Avail: NTIS HC A12/MF A01

A nominal 700-hp, Radial Inlet Steam Turbine (RIT) which has demonstrated that small units of this type can nearly double existing machine efficiencies is discussed. A shaft efficiency of 80 was attained during verification tests. The ultimate goal of this cost shared program was to further reduce reliance on foreign oil imports by establishing and fielding a family of fuel efficient, small steam turbines. The design parameters of the prototype unit are established. Potential energy savings are predicted on an appraisal of the degree to which this family of enhanced efficiency, small turbines can penetrate the market over the next decade. It is concluded that 61% of the present user population would replace existing units if the pay back period was no more than 3.6 years. Projected first costs, determined by detailed dsesign evaluation, show pay backs less than one year for all sizes. DOE

N83-36499# Argonne National Lab., Ill. Energy and Environmental Systems Div.
A STRUCTURAL-CERAMIC RESEARCH PROGRAM: A PRELIMINARY ECONOMIC ANALYSIS
Larry R. Johnson, Arvind P. S. Teotia, and Lawrence G. Hill Mar. 1983 81 p refs
(Contract W-31-109-eng-38)
(DE83-014263; ANL/CNSV-38) Avail: NTIS HC A05/MF A01

The macroeconomic impacts (effects on gross national product, employment, fuel imports, and balance of trade) were modeled for two scenarios, one in which the US dominates the commercialization of ceramics in heat engines throughout the 1990s and the other in which Japan dominates. The positive effects of US dominance were forecast to be substantially greater than the negative effects of foreign dominance due to two assumptions: (1) Japanese ceramic commercialization does not include the truck and stationary engine markets because of a lack of historical presence in these areas and (2) imports of Japanese cars with ceramic engines are legislatively limited to 30% of new car sales. It is found that improved ceramics can also be substituted for superalloys containing strategic materials and thus reduce US dependence on foreign suppliers. DOE

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N83-36500*# Ohio State Univ., Columbus.
ULTRASONIC WAVE PROPAGATION IN TWO-PHASE MEDIA: SPHERICAL INCLUSIONS Final Report
L. S. Fu and Y. C. Sheu Washington NASA Oct. 1983 21 p refs
(Grant NsG-340)
(NASA-CR-3732; NAS 1.26:3732) Avail: NTIS HC A02/MF A01 CSCL 20A

The scattering theory, recently developed via the extended method of equivalent inclusion, is used to study the propagation of time-harmonic waves in two-phase media of elastic matrix with randomly distributed elastic spherical inclusion materials. The elastic moduli and mass density of the composite medium are determined as functions of frequencies when given properties and concentration of the spheres and the matrix. Velocity and attenuation of ultrasonic waves in two-phase media are determined for cases of distributed spheres and localized damage. An averaging theorem that requires the equivalence of the strain energy and the kinetic energy between the effective medium and the original matrix with spherical inhomogeneities is employed to derive the effective moduli and mass density. The functional dependency of these quantities upon frequencies and concentration provides a

method of data analysis in ultrasonic evaluation of material properties. Numerical results or moduli, velocity and/or attenuation as functions of concentration of inclusion material, or porosity, are graphically displayed. Author

N83-36501# Scientific Measurement Systems, Inc., Austin, Tex.
X-RAY COMPUTED TOMOGRAPHY FOR AEROSPACE COMPONENTS Final Report, Sep. 1980 - Jan. 1983
Forrest Hopkins and Ira Lon Morgan Wright-Patterson AFB, Ohio AFWAL Jan. 1983 97 p refs
(Contract F33615-80-C-5145)
(AD-A128981; AFWAL-TR-82-4128) Avail: NTIS HC A05/MF A01 CSCL 20/6

This document contains a study of the optimization of certain parameters of computed tomography systems for inspection of aerospace components, in general, and solid propellent rocket motors, in particular. The report consists of a series of computer simulations and empirical measurements which treat specific cases of appropriate phantoms. The phenomena of beam hardening and scattering, which can occur extensively in high energy, industrial tomography, are investigated in detail. The primary finding is that computed tomography appears to be a feasible, new method for non-destructive inspection of rocket motors. Author (GRA)

N83-36502# City Coll. of the City Univ. of New York. Dept. of Mathematics.
ON THE RELIABILITY OF REPAIRABLE SYSTEMS
Mark Brown Oct. 1982 19 p refs
(Grant AF-AFOSR-0024-82; AF Proj. 2304)
(AD-A130037; CUNY-MB1; TR-82-01-AFOSR; AFOSR-83-0547TR) Avail: NTIS HC A02/MF A01 CSCL 14/4

The problem of time to first failure for repairable coherent systems of independent exponential components is discussed. Several inequalities are derived and related to previous work of the author and of Keilson to obtain approximations with error bounds for the distribution of the time to first failure. Author (GRA)

N83-36503# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
SOME DISTRIBUTIONS ARISING AS A CONSEQUENCE OF ERRORS IN INSPECTION
Norman L. Johnson (North Carolina Univ.) and Samuel Kotz Jul. 1983 15 p refs
(Contract N00014-81-K-0301)
(AD-A129918; UMD-DMSS-83/3) Avail: NTIS HC A02/MF A01 CSCL 14/4

In this paper the authors survey and consolidate their investigations during this years 1980-1983 dealing with consequences of errors in inspection sampling models. Some indication of the current and future research is given. Selective bibliography is presented. Author (GRA)

N83-36504# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex. Analytical Services Div.
QUALITY ASSURANCE GUIDE Final Report
Jerry F. Thomas Feb. 1983 31 p refs
(AD-A129237) Avail: NTIS HC A03/MF A01 CSCL 15/5

This guide on quality assurance provides instructions and other information pertinent to USAF OEHL's pursuit of producing high quality and analytical work. It identifies the various performance evaluation programs in which the USAF OEHL participates. Also included are areas on quality control data handling, reagents, glassware and glassware cleaning. GRA

N83-36505# IRT Corp., San Diego, Calif.
INSPECTION OF SONAR DOME RUBBER WINDOWS USING COLLIMATED PHOTON SCATTERING Final Report, 4 Mar. - 6 Jun. 1983
Nicholas Vagelatos, Dale D. Thayer, Kenneth Brown, and Frederic N. Howe, Jr. Jun. 1983 36 p refs
(AD-A129712) Avail: NTIS HC A03/MF A01 CSCL 11/10

Laboratory measurements have been performed on a test piece of sonar dome rubber window (SDRW) which demonstrate the feasibility of using the collimated photon scattering (CPS) technique to detect and measure defects, especially voids, in SDRW. The CPS technique was originally identified by IRT as a powerful industrial inspection method for certain nondestructive evaluation tasks about eight years ago and has since been successfully implemented by IRT in industrial inspection machines. This research effort has demonstrated that CPS can distinguish between air and water filled voids in addition to detecting their presence, precise location size. Computer data display in two and three dimensional plots which clearly show presence, location, size, and air of water filled status of voids. A conceptual design is presented which demonstrates that CPS can be readily implemented in terms of practical, operational inspection hardware suitable for the indock inspection of domes installed in ships and for newly manufactured domes on a hydrotest fixture. Basic design parameters have been estimated and a scenario is operational hardware in about 27 months at an estimated total budgetary price of about $1.3 million. This schedule could be significantly shortened with the acceptance of some program concurrency and at some increase in price. Operational hardware could be engineered to be suited for operation by Navy personnel, or by IRT personnel on a service basis if that approach were selected. GRA

N83-36506# Westinghouse Hanford Co., Richland, Wash. Instrument Development.
THERMAL NDE METHOD FOR THERMAL-SPRAY COATINGS
D. R. Green, M. D. Schmeller (Puget Sound Naval Shipyard, Bremerton, Wash.), and R. A. Sulit (Naval Sea Systems Command, Washington, D.C.) [1982] 16 p refs
(DE83-012154; HEDL-SA-a2796-FP) Avail: NTIS HC A02/MF A01

A feasibility demonstration of a thermal scanning NDE system for thermal spray coatings is described. Nonbonds were detected between several types of coatings and their substrates. Aluminum antiskid coatings having very rough surfaces were included. A technique for producing known nonbond areas for calibrating and demonstrating NDE methods was developed. Author

N83-36507# Los Alamos Scientific Lab., N. Mex. Design Engineering Div.
MICROCOMPUTERS AND NONDESTRUCTIVE TEST SYSTEMS
Ronald D. Strong 1983 7 p Presented at the Automated Nondestructive Evaluation Conf., Idaho Falls, Idaho, 28-30 Jun. 1983
(Contract W-7405-eng-36)
(DE83-012667; LA-UR-83-1410; CONF-830652-4) Avail: NTIS HC A02/MF A01

The application of the LSI-11 series microcomputers in systems developed and used by the nondestructive testing (NDT) is described. These systems are used for ultrasonic testing and industrial computerized tomography. The systems can be intefaced to a variety of NDT instrumentation. Frequently, the NDT instrumentation used dos not have a digital capability and has only analog outputs. A general purpose interface was designed to accept and digitize the analog inputs and to display data on a storage cathode ray tube display. The systems contain translator circuits to drive stepper motors. While each system is normally coupled to a specific scanning device, its use is not restricted to only that scanner since the system can be easily programmed to drive other motors or scanners. Special purpose fixtures can be designed, built, and interfaced to the control system to perform inspections of special parts when the part has an axis of symmetry that can be used to simplify the scanning process. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N83-36508 Rensselaer Polytechnic Inst., Troy, N. Y.
STRESS ANALYSIS METHODS FOR CLEARANCE-FIT MECHAN-

ICAL JOINTS IN LAMINATED COMPOSITES Ph.D. Thesis
Wonsub Kim 1982 232 p
Avail: Univ. Microfilms Order No. DA8303070

Semi-empirical techniques are presented for analyzing mechanically fastened joints with initial clearance between pin and hole. The results of photoelastic test and finite element stress analysis were correlated to determine the extent of pin-hole contact. Although a variety of complicated contact problems can be solved with this relatively simple technique, a single fastener type joint was chosen to be studied in this research. The material selected is laminated Graphite/Epoxy composite. Although correlation with photoelastic experiments has the advantage of verifying the adequacy of the FEM mesh used in the theoretical analysis, even better results are possible as regards to pin-hole contact when an interactive computational method is used. In this approach computer graphic displays of the deformed hole are observed, and the extent of pin-hole contact varied until a smooth curve is obtained for the deformed hole contour. Dissert. Abstr.

N83-36509*# Maine Univ., Orono.
FATIGUE BEHAVIOR OF ADHESIVELY BONDED JOINTS Final Report
Shankar Mall 31 Aug. 1983 11 p refs
(Contract NCC1-70)
(NASA-CR-174458; NAS 1.26:174458) Avail: NTIS HC A02/MF A01 CSCL 20K

The fatigue damage mechanism of composite to composite adhesively bonded joints was characterized. The mechanics of the possible modes of fatigue damage propagation in these joints when subjected to constant amplitude cyclic mechanical loading were investigated. The possible failure modes in composite bonded joints may be cyclic debonding (i.e., progressive separation of the adhesive), interlaminar damage (delamination), adherend fatigue or a combination of these. Two composite systems - graphite/epoxy adhesively bonded to graphite/epoxy and Kevlar 49/epoxy adhesively bonded to Kevlar 49/epoxy were investigated. Both composite systems consisted of quasi-isotropic lay-ups, i.e., [0 deg/-45 deg/+45 deg/90 deg]s. The two adhesives, employed in the study were (1) EC 3445 with cure temperature of 250 F for secondary bonding and (2) FM 300 with cure temperature of 350 F for co-cure bonding. S.L.

N83-36510*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A FRACTURE MECHANICS APPROACH FOR DESIGNING ADHESIVELY BONDED JOINTS
W. S. Johnson and S. Mall (Maine Univ., Orono) Sep. 1983 22 p refs Proposed for presentation at the ASTM Symp. on Delamination and Debonding of Mater., Philadelphia, 8-10 Nov. 1983
(NASA-TM-85694; NAS 1.15:85694) Avail: NTIS HC A02/MF A01 CSCL 20K

An analytical and experimental investigation was undertaken to determine if the adhesive debond initiation stress could be predicted for arbitrary joint geometries. The analysis was based upon a threshold total strain-energy-release rate (Gth) concept. Two bonded systems were tested: T300/5208 graphite/epoxy adherends bonded with either EC-3445 or FM-300 adhesive. The Gth for each adhesive was determined from cracked-lap-shear (CLS) specimens by initiation tests. Finite-element analyses of various tapered CLS specimen geometries predicted the specimen stress at which the total strain-energy-release rate (GT) equaled Gth at the joint tip. Experiments verified the predictions. The approach described herein predicts the maximum stress at which an adhesive joint can be cycled yet not debond. Furthermore, total strain-energy-release rate appeared to be the driving parameter for cyclic debonding and debond initiation in structural adhesives. In addition, debond initiation and growth were found to occur with virtually no peel stress present. Author

N83-36511# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
PENALTY FUNCTION METHOD FOR OPTIMAL DESIGN OF MULTIPURPOSE VIBRATING BEAMS
S. Adali Mar. 1982 28 p refs
(CSIR-TWISK-253) Avail: NTIS HC A03/MF A01

A computational design algorithm is formulated to determine the optimal area distribution of a beam which undergoes free and forced harmonic vibrations during its service life. The structural element has to serve more than one function, and this necessitates a design which meets various requirements. Hence, the constraints on the multipurpose beam involve simultaneously its dynamic response under single or multiple loads and its fundamental frequency. These problems are formulated in a mathematical programming format by expressing the area function in terms of linear splines. The resulting optimization problems are solved using suitable penalty functions. The proposed design method is illustrated by several numerical examples which show the complex tradeoffs involved in the design of multipurpose structures. Author

N83-36512# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
PLASTIC BUCKLING OF INITIALLY IMPERFECT STIFFENED CYLINDERS IN AXIAL COMPRESSION
G. A. Duffett and B. D. Reddy Oct. 1981 34 p refs
(TR-8) Avail: NTIS HC A03/MF A01

The behavior in the plastic range of axially compressed stringer stiffened cylinders is investigated. The shell under consideration is assumed to have an initial imperfection in the form of sinusoidal deviation both axially and circumferentially. The constitutive relation employed here is J (sub z) deformation theory of plasticity. This relation, as well as kinematic assumptions regarding the behavior of the panels and stiffeners which constitute the stiffened shell, is used in the principle of virtual work to obtain a set of nonlinear algebraic equations whose solution provides complete information about the prebuckling equilibrium path. Bifurcation from the primary path is examined by making use of a functional whose first variation is zero when two solutions to the problem are possible. This leads to an eigenvalue problem, the eigenvalue being the critical compressive load and the eigenfunction being the corresponding buckling mode. Author

N83-36513# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
DEFORMATION AND FRACTURE AT ISOLATED HOLES IN PLAN-STRAIN TENSION
R. J. Bourcier, R. E. Smelser, O. Richmond, and D. A. Koss Apr. 1983 23 p refs Prepared in cooperation with U.S. Steel Corp., Monroeville, Pa.
(Contract N00014-76-C-0037; NR Proj. 031-756)
(AD-A128995; TR-21) Avail: NTIS HC A02/MF A01 CSCL 20/11

The tensile behavior of plane-strain specimens each having a central hole with axis in the zero-strain direction has been examined. The study is based on the contrasting behavior of two materials, one with a relatively high strain hardening rate (an HSLA steel) and the other with a low rate (Ti-6Al-4V). Deformation of the holes, associated necking of the ligaments, as well as the overall force-elongation response exhibits excellent agreement with predictions from a large-strain elastoplastic finite-element model. Failure of the high strain-hardening material occurs by ductile tearing across the ligaments whereas failure of the low-hardening material occurs by shear localization. This is consistent with the predicted incremental plastic strain distributions as calculated by the finite element method. The experimental results and predictions of the finite-element models indicate the importance of work hardening in diffusing plastic flow in the presence of a geometric inhomogeneity. Author (GRA)

N83-36514# Finmet Consultants, Edgbaston (England).
A REVIEW OF FATIGUE CRACK GROWTH IN METALLICS AT LOW STRESS INTENSITIES Final Scientific Report, 1 Jul. - 31 Dec. 1982

C. J. Beevers 1 Jan. 1983 128 p refs
(Contract F49620-82-C-0088)
(AD-A128721; EOARD-TR-83-10) Avail: NTIS HC A07/MF A01 CSCL 20/11

This review is concerned with the fatigue crack growth response of metallics at low stress intensities. In particular the fatigue threshold e.g. the stress intensity at which cracks can arrest is considered in detail. The fatigue crack growth rates and the fatigue threshold stress intensity delta K/th are considered in relation to the following variables, mean stress, yield stress, test temperature, test frequency, fatigue crack closure, microstructure, environment and crack length. The mechanisms, models and formulations derived to represent fatigue crack growth at low stress intensities and the fatigue threshold are also reviewed. The measurement of fatigue crack growth rates and fatigue thresholds is outlined and the desirability of obtaining delta K/eff data is highlighted. The main characteristics of aluminum alloys, steels and titanium alloys with respect to fatigue crack growth and fatigue thresholds are presented. A conservative view of the fog resistance of metals and alloys is developed which allows the identification of the minimum fatigue threshold and maximum fog rates that can be experienced for a particular set of test conditions. Author (GRA)

N83-36515# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
THE RESPONSE OF A CYLINDRICAL SHELL TO BULK CAVITATION LOADING Final Report, Jul. 1980 - Jun. 1981
Martin H. Marcus Jan. 1983 26 p refs
(SF50199600)
(AD-A130030; AD-F500160; NSWC/TR-81-295) Avail: NTIS HC A03/MF A01 CSCL 19/4

An analysis is developed for the response of a cylindrical shell to a bulk cavitation loading. Due to the fluid-structure interaction inherent in the problem, it is convenient to use the USA-STAGS code. This program couples the fluid and structural motions using the Doubly Asymptotic Approximation (DAA) and solves for the structural response with the finite element method. In the example treated it appears that the bulk cavitation loading may be as damaging to the shell as the direct shock of the explosives. GRA

N83-36516# Army Materials and Mechanics Research Center, Watertown, Mass. Materials Characterization Div.
THE MEASUREMENT OF RESIDUAL STRESS WITH X-RAY DIFFRACTION Final Report
Charles P. Gazzara May 1983 49 p refs
(DA Proj. 1L1-61102-AH-42)
(AD-A130614; AMMRC-MS-83-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

A concise summary of the application of X-ray diffraction principles involved in the measurement of residual stresses is presented for those users of this technique having little exposure to this field. The latest developments in X-ray diffraction residual stress analysis, XRDRSA, are applied in simplified form so that this report can serve as a working manual. Five general areas are considered, namely: theory, history and progress, technical problems, apparatus, and examples of specific problems involving the measurement of residual stresses using X-ray diffraction procedures. Much of the material presented is the result of research (6.1) and Materials Testing Technology (MTT) projects conducted at AMMRFC and was presented at a seminar at the Naval Air Rework Facility in San Diego, Calif. on 18 and 19 November, 1981. Author (GRA)

N83-36517# Dayton Univ., Ohio.
THE APPLICATION OF A NONLINEAR FRACTURE MECHANICS PARAMETER TO DUCTILE FATIGUE CRACK GROWTH Final Report, Sep. 1978 - Dec. 1982
G. A. Hartman, III, A. M. Rajendran, and D. S. Dawicke Wright-Patterson AFB, Ohio AFWAL Dec. 1982 126 p refs
(Contract F33615-78-C-5184; AF Proj. 2418)
(AD-A130402; AFWAL-TR-83-4023) Avail: NTIS HC A07/MF A01 CSCL 20/11

This report describes the methodology for predicting fatigue crack growth rate response of cracked structural components wherein the assumptions of linear elastic fracture mechanics are violated. Fatigue crack growth rate tests were conducted on copper specimens using compact tension (CT), centercracked panel (CCP), and radial-hole cracked (RHC) geometries. The CT and CCP specimens provided baseline fatigue crack growth rate data that were utilized to predict both the fatigue crack growth rate and the crack growth life behavior of the RHC test specimens. The nonlinear fracture mechanics parameter chosen for extensive study on this program was the J-Integral. Crack growth rate correlations were based on J max, i.e., the J-Integral evaluated at the maximum loading condition, rather than the more traditional delta J associated with the range of load. Three calculations of Jmax were made; two were based on numerical results, the other on experimental results. The numerical J max values were based on (1) the line integral calculated using nonlinear finite element results and (2) the Shih estimating scheme which assumes power law hardening behavior. The experimental Jmax values were based on the method for measuring the change in the potential energy of deformation using load displacement data recorded during a fatigue test. GRA

N83-36518# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
COMPUTER PROGRAM WITH INTERACTIVE GRAPHICS FOR ANALYSIS OF PLANE FRAME STRUCTURE (CFRAME), REVISION
Joseph P. Hartman and John J. Jobst Jan. 1983 69 p
(AD-A129507; WES-INSTRUCTION-K-83-1) Avail: NTIS HC A04/MF A01 CSCL 13/13

This report documents and describes the use of the general-purpose computer program CFRAME for analysis of plane frame structures. The intent was to develop an easy-to-use program incorporating the best features of many similar programs and to provide the many additional capabilities required by a diverse group of users. CFRAME utilizes the stiffness method of structural analysis. The Cholesky decomposition method is used to solve the resulting matrix equation. Automatically generated routines are available to simplify the data input. Graphic display of the input data is also available. The output may be printed or displayed with graphics. Author (GRA)

N83-36519# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
CRACK INITIATION AND PROPAGATION IN METALS IN LIQUID MERCURY USING FRACTURE MECHANICS Final Report
J. A. Kapp Mar. 1983 40 p refs Presented at the Fall AIME Meeting, St. Louis, Oct. 1982
(AD-A129555; ARLCB-TR-83007) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fracture mechanics is a useful tool in the study of sub-critical crack growth. This report presents a summary of the results of several recent fracture mechanics studies of liquid metal embrittlement. Specific topics include crack growth measurements under cyclic loading conditions in 6061-T651 alloy embrittled by liquid mercury. The effect of mean stress on fatigue crack growth in a high strength-low alloy steel in mercury is discussed. Crack growth studies under static loading conditions at various temperatures in both 6061-T651 aluminum and 70/30 alpha brass embrittled by mercury are also presented. Finally, some experiments on mercury wetted 70/30 alpha brass in Mode 3 loading (pure shear) are presented. The results are discussed in relation to transport mechanisms. Author (GRA)

N83-36520# Forest Products Lab., Madison, Wis.
PLANE STRESS ANALYSIS OF WOOD MEMBERS USING ISOPARAMETRIC FINITE ELEMENTS: A COMPUTER PROGRAM
Terry D. Gerhardt Mar. 1983 18 p refs
(AD-A129453; FSGTR-FPL-35) Avail: NTIS HC A02/MF A01 CSCL 02/6

This research is designed to establish rational engineering

design procedures for wood pallets. The author's role in this endeavor is to determine the stiffness and strength of notched stringer members of pallets as functions of notch geometry, material properties, and loading conditions. As part of this effort, the author developed the FE program described in this paper to compute displacements and stresses in wood members of any geometrical shape which are under arbitrary plane stress or strain-loading conditions. This computer program is to be applied to the notched-stringer problem. Details of the program development, user instructions, and program listing are presented in this report. The program was verified by a comparison of FE predictions of displacements and strains in center-loaded, double-tapered wood beams with data available in the literature. This comparison is presented in another paper. GRA

N83-36521# New Mexico Univ., Albuquerque. Engineering Research Inst.
REDUCED EXPERIMENTAL STRESS-STRAIN RESULTS FOR A LOW-STRENGTH CONCRETE UNDER MULTIAXIAL STATES OF STRESS Final Report
L. A. Traina, S. M. Babcock, and H. L. Schreyer Kirtland AFB, N. Mex. AFWL May 1983 132 p refs
(Contract F29601-81-C-0013; AF Proj. 8809)
(AD-A129716; AFWL-TR-83-3) Avail: NTIS HC A07/MF A01 CSCL 11/2

Results of an experimental program on low strength concrete under multiaxial states of stress were evaluated for consistency and for baseline shifts. After adjustments were made to the data, various plots of the experimental results were prepared. Loading paths and limit points are shown in plots of stress and strain, pressure and volumetric strain, three stress invariants, and three inelastic strain invariants. The result is a set of curves that are beneficial for developing and evaluating constitutive models. GRA

N83-36522# Dayton Univ., Ohio. Aerospace Mechanics Div.
STRAINS FROM PROJECTION MOIRE DATA Final Report, Sep. 1981 - Mar. 1982
B. Basava Raju, Blaine S. West, and Andrew J. Piekutowski Wright-Patterson AFB, Ohio AFWAL Feb. 1983 68 p refs
(Contract F33615-80-C-3401; AF Proj. 1926)
(AD-A129416; AFWAL-TR-83-3020; UDR-TR-82-142) Avail: NTIS HC A04/MF A01 CSCL 20/11

The main objective of this program was to determine and evaluate the surface strains from out-of-plane deformations determined by the projection moire method of large surfaces experiencing static loads. The program consisted of three primary tasks: (1) design of an experiment consisting of a four-point bending fixture and a 26x6x1/4 inch flat test specimen, moire device, strain gage instrumentation, and dial gages, and the collection of experimental data for various static loads; (2) analytical prediction of the deflections and strains by small and large deflection beam theories and small deflection plate theory; (3) computation of strains from the moire deflections by a number of numerical curve fitting techniques; and (4) comparison of the strains determined from the moire technique with experimental and theoretical strains. Tests were conducted at loads from 50 to 300 pounds in 50 pound load increments and strains were computed from moire deflections by using second and third order polynomials and a second order Legendre polynomial. Both the deflections and strains were accurately determined for the flat surfaces investigated. GRA

N83-36523# Cape Town Univ. (South Africa). Nonlinear Structural Mechanics Research Unit.
MODE CONVERGENCE IN SYMMETRIC IMPULSIVELY LOADED RIGID-PLASTIC BEAMS
J. B. Martin and A. R. Lloyd Jan. 1982 23 p refs
(TR-13) Avail: NTIS HC A02/MF A01

The question of convergence onto higher modes in impulsively loaded rigid, perfectly plastic beams is considered. Two specific examples are studied: a fixed end and a simply supported beam in which the velocity field is symmetric and in which there are three hinges in the interior of the span. The equations of motion are written in terms of shape parameters, and the trajectories of the solutions of these equations show geometrically how the shape of the velocity field changes with time. Difficulty is experienced, however, in determining the trajectories which pass through points defining higher modes. N.W.

N83-36524# Lockheed Aircraft Corp., Palo Alto, Calif.
BUCKLING OF STEEL CONTAINMENT SHELLS. TASK 2: ELASTIC-PLASTIC COLLAPSE OF NONUNIFORMLY AXIALLY COMPRESSED RING-STIFFENED CYLINDRICAL SHELLS WITH REINFORCED OPENINGS Final Report, 25 Aug. 1980 - 30 Sep. 1982
Eli Meller and David Bushnell Dec. 1982 121 p refs
(DE83-900982; NUREG/CR-2836-Vol-2; LMSC-D-812950-Vol-2)
Avail: NTIS HC A06/MF A01; also available from GPO $6.00

Results of nonlinear finite element analysis of several axially compressed, ring stiffened, steel, cylindrical shells are presented, including comparisons with other tests. The specimens, all with radius to thickness ratio of about 450, have reinforced circular openings that cut across various numbers of ring stiffeners. The cylinders are loaded by enforced axial displacement applied to thick end plates halfway between the axis of revolution and the cylindrical shell wall. Measured imperfections are included in the analysis of a ring stiffened specimen without any cutout. Inclusion of the imperfection field reduces the predicted collapse load by only eight per cent. Reinforced openings that cut one, two and three rings reduce the collapse load by 14, 21, and 22 percent, respectively. DOE

N83-36525# Lockheed Aircraft Corp., Palo Alto, Calif.
BUCKLING OF STEEL-CONTAINMENT SHELLS. TASK 3: PARAMETER STUDIES Final Report, 25 Aug. 1980 - 30 Sep. 1983
Bo Almroth, Charles Rankin, and David Bushnell Dec. 1982 73 p refs
(DE83-900981; NUREG/CR-2836-Vol-3; LMSC-D-812950-Vol-3)
Avail: NTIS HC A04/MF A01; also available from GPO $5.00

The choice of knockdown factors to be used in the design of containment vessels is discussed. The design recommendations are based on experimental results pertaining to shells subjected to uniform static loading. Relatively few experiments were performed on fabricated shells typical of civil engineering structures. A variety of factors have some effect on the imperfection sensitivity of shell structures, such as ratios between basic dimensions, degree of stiffening, inelastic deformation, duration and uniformity of loading. Therefore, it is hardly possible to collect sufficient empirical information to allow for the development of truly satisfactory design procedures. It is suggested here that the situation can be greatly improved if numerical experimentation based on computer analysis of shells with random imperfections is used to enlarge the basis for the procedures. DOE

N83-36526# Bendix Corp., Kansas City, Mo.
CALIBRATION OF HOLE-IN-HOLE RESIDUAL-STRESS MEAUREMENT TECHNIQUE Final Report
G. D. Swanson Apr. 1983 44 p refs
(Contract DE-AC04-76DP-00613)
(DE83-011408; BDX-613-2914) Avail: NTIS HC A03/MF A01

The hole in hole residual stress measurement technique as a way to measure the residual stress distribution through intermediate thickness (12-mm) metal parts was investigated. Relieved surface strain data from a set of hole in hole calibration experiments were evaluated. The large hole caused a stress concentration problem in the region below its bottom which the next small hole investigates. This stress concentration was modified by eliminating the small holes and using finer increments of the large hole. It is shown that an incremental drilling technique is a better method for measuring the residual stress distribution through intermediate thickness metal parts. DOE

N83-36527# Oak Ridge National Lab., Tenn. Computer Sciences.
SPARSE ORTHOGONAL SCHEMES FOR STRUCTURAL OPTIMIZATION USING THE FORCE METHOD

Michael T. Heath, Robert J. Plemmons (North Carolina State Univ., Raleigh), and Robert C. Ward May 1983 25 p refs
(Contracts W-7405-eng-26; DAAG29-81-K-0132)
(DE83-013739; ORNL/CSD-119) Avail: NTIS HC A02/MF A01

Historically there are two principal methods of matrix structural analysis, the displacement (or stiffness) method and the force (or flexibility) method. The force method was used relatively little because the displacement method was deemed easier to implement on digital computers, especially for large sparse systems. The force method has theoretical advantages, however, for multiple redesign problems or nonlinear elastic analysis because it allows the solution of modified problems without restarting the computation from the beginning. An implementation of the force method which is numerically stable and preserves sparsity is given. Although it is motivated by earlier elimination schemes, each of the two main phases of the force method is carried out using orthogonal factorization techniques developed for linear least squares problems. DOE

N83-36528# Brookhaven National Lab., Upton, N. Y. Structural Analysis Div.
SEISMIC ANALYSIS OF PIPING SYSTEMS SUBJECTED TO INDEPENDENT-SUPPORT EXCITATION
M. Subudhi and P. Bezler 1983 11 p refs Presented at the Am. Soc. of Mech. Engr. Pressure Vessel and Piping Conf., Portland, Oreg., 19 Jun. 1983
(Contract DE-AC02-76CH-00016)
(DE83-012215; BNL-NUREG-32862; CONF-830607-11) Avail: NTIS HC A02/MF A01

Dynamic responses of piping systems subject to independent support excitation using the response spectrum and time history methods were compared. The BNL finite element computer code PSAFE2 has performed all the analyses. The time history method combines both the inertia as well as static effect on the piping responses due to independent support excitations at each time point, thus representing the actual responses. A sample problem is analyzed subjected to two independent support excitations and the results are presented in comparison with the response spectrum methods with uniform or independent support motion. DOE

N83-36529# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
REINFORCED-CONCRETE CONTAINMENT SAFETY UNDER HYDROGEN-EXPLOSION LOADING Technical Report, Sep. 1980 - Apr. 1982
Michael N. Fardis, Alex Nacar, and Michael A. Delichatsios Sep. 1982 218 p ref
(DE83-900083; NUREG/CR-2898) Avail: NTIS HC A10/MF A01

The behavior and safety of a typical steel lined reinforced concrete containment under postulated hydrogen explosions are investigated. The response to the quasistatic deflagration loading is computed by axisymmetric nonlinear Finite Element analysis. In the Finite Element model, the concrete, the linear and the individual layers of reinforcing steel are modeled separately. Special attention is paid to the development and use of realistic, yet computationally simple and efficient models for the stress-strain and failure of each material. From the point of view of structural integrity, the dominant uncertainty in material properties is the one due to natural viability in the stress-strain behavior and strength of individual reinforcing bars and of mechanical splices. Loss of ductility and rupture of one of these bars or splices, causes all bars connected in series to it to shed their load. N.W.

N83-36530# Sandia Labs., Albuquerque, N. Mex.
DYNAMIC INSTABILITY IN ADIABATIC THERMOPLASTIC SHEAR
Timothy J. Burns 1983 3 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983
(Contract DE-AC004-76DP-00789)
(DE83-015206; SAND-83-0801C; CONF-830719-7) Avail: NTIS HC A02/MF A01

The formation of adiabatic shear bands in ductile metals under dynamic loading conditions which is thought to result from a material instability associated with a peak in the curve of engineering plastic flow stress vs engineering shear strain was examined. The instability rises from the effect of thermal softening, caused by irreversible adiabatic heating, which counteracts the tendency of the material to harden with increasing plastic strain. Asymptotic analysis of a one dimensional rigid thermoviscoplastic model shows that shear band formation in this situation can be interpreted as a bifurcation from a homogeneous shearing deformation which occurs near the peak in the homogeneous stress strain curve. It is shown that the growth rate of small perturbations on the homogeneous deformation is controlled by the ratio of the slope of the homogeneous stress vs strain curve to the material viscosity, like the rate of change of the plastic flow stress with respect to the strain rate. It is shown that this growth rate is essentially independent of the wavelength of the small perturbation. Numerical methods are used to show that this growth rate beyond the bifurcation point may not be sufficiently large for the model to account for the experimental data. DOE

N83-36531# California Univ., Livermore. Lawrence Livermore Lab.
DEFORMATION AND THERMODYNAMIC RESPONSE DURING BRITTLE FRACTURE
R. B. Stout Jun. 1983 6 p refs Presented at Intern. Union of Theoretical and Appl. Mech. Conf., Evanston, Ill., 11 Sep. 1983
(Contract W-7405-eng-48)
(DE83-014870; UCRL-89380; CONF-830975-2) Avail: NTIS HC A02/MF A01

Extensions of Griffith's and other continuum mechanics concepts to obtain a discontinuum model of the deformations and thermodynamics during brittle fracture are described. The model describes crack density with a statistical mechanics approach, and makes an analogy between a crack and a dislocation. A scalar crack density function can be defined analogous to a scalar dislocation density function. The scalar crack density is a function argument in a functional representation for the relative deformations between atoms. The relative deformation functional has a lattice structure deformation that is represented by a function as an in continuum mechanics and a crack deformation that is represented by a functional somewhat analogous to the discontinuum mechanics for dislocations. The thermodynamics is almost analogous to that for disloctions, except for the surface dependence during crack propagation and crack opening. The deformation and thermodynamic modelling, are outlined. DOE

N83-36532# National Bureau of Standards, Washington, D.C. Radiometric Physics Div.
ELEMENTS OF THERMOGRAPHY FOR NONDESTRUCTIVE TESTING Final Report
Julius Cohen May 1983 39 p refs
(PB83-220806; NBS-TN-1177) Avail: NTIS HC A03/MF A01 CSCL 14B

An elementary review of thermal imaging systems is presented, with emphasis on the application of thermography to nondestructive testing. Topics discussed include heat radiation theory; early and contemporary thermal imaging systems; performance characteristics; effects of emissivity, background temperature, atmosphere, and field of view. Examples of various applications of thermography to nondestructive testing are given. GRA

N83-36533# Iowa Univ., Iowa City. Computer-Aided Engineering Instructional Lab.
STRUCTURAL DESIGN SENSITIVITY ANALYSIS WITH GENERAL BOUNDARY CONDITIONS
C. C. Hsieh and J. S. Arora Mar. 1983 69 p refs
(Grant NSF CEE-80-08102)
(PB83-212035; CAD-SS-83.5; NSF/CEE-83024) Avail: NTIS HC A04/MF A01 CSCL 20K

Methods of design sensitivity analysis of structural and mechanical systems when general boundary conditions are used in the analysis phase are presented. Design sensitivity analysis is needed when optimum design or trend information for a system is

required. The static response problem and the eigenvalue and transient response problems are considered. For both static and dynamic problems, several forms of the structural design sensitivity equations are presented so that they are compatible with any existing finite element analysis computer code. Methods developed are evaluated with the help of numerical examples. GRA

N83-36534# Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
FATIGUE PROBLEMS IN STRUCTURAL CONTROL
Dian-Fu Wang and J. T. P. Yao 1983 28 p refs
(Grant NSF CEE-80-18963)
(PB83-211763; CE-STR-83-1; NSF/CEE-83021) Avail: NTIS HC A03/MF A01 CSCL 13M

The active control strategy for reducing the vibrations of elastic structures is sought. Optimal model-following is applied, and the control system synthesis method is used to make the actual system behave like a specified ideal model. The actual vibrating elastic structure with control forces and random disturbance is described with a system of first order linear differential equations. An idealized structural model can be represented by a linear control system subjected to a filtered white noise. The model is used as a part of the control system as a prefilter, which is used to produce a narrow-band random process for predicting random fatigue behavior. Several numerical examples are provided. GRA

N83-36067*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISTRIBUTED SYSTEM MODELING OF A LARGE SPACE ANTENNA
M. Hamidi, G. Rodriguez, and D. B. Schaechter *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 89-102 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

N83-36069*# California Inst. of Tech., Pasadena.
VIBRATION SUPPRESSION IN LARGE SPACE STRUCTURES
T. K. Caughey and C. J. Goh *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 119-142 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

N83-36071*# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
A CLOSED-LOOP PRINCIPAL COMPONENT ANALYSIS OF A TETRAHEDRAL TRUSS
Edmond A. Jonckheere *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 163-180 refs (For primary document see N83-36061 24-18)
(Grant NSF ECS-81-12327)
Avail: NTIS HC A99/MF A01 CSCL 20K

N83-36092*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
IDENTIFICATION OF LARGE FLEXIBLE STRUCTURES MASS/STIFFNESS AND DAMPING FROM ON-ORBIT EXPERIMENTS
S. L. Hendricks, S. Rajaram, M. P. Kamat, and J. L. Junkins *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 511-520 refs Submitted for publication (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

N83-36094*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
PARAMETER ESTIMATION IN TRUSS BEAMS USING TIMOSHENKO BEAM MODEL WITH DAMPING
C. T. Sun and J. N. Juang (Martin Marietta Aerospace, Denver) *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 531-545 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 20K

42 GEOSCIENCES (GENERAL)

N83-36535# California Univ., Livermore. Lawrence Livermore Lab.
[TECHNICAL OBJECTIVES AND HIGHLIGHTS OF THE ATMOSPHERIC AND GEOPHYSICAL SCIENCES DIVISION OF THE PHYSICS DEPARTMENT] Program Report, FY 1982
J. B. Knox, M. C. MacCracken, M. H. Dickerson, P. M. Gresho, F. M. Luther, and R. C. Orphan Mar. 1983 77 p refs
(Contract W-7405-eng-48)
(DE83-013697; UCRL-51444-82) Avail: NTIS HC A05/MF A01

The research and the scientific programs are organized into five research themes, each has a commonality of interest, and shared analysis or modeling capabilities. The themes are advanced modeling, regional modeling and assessments, CO2 and climate research, stratospheric research, and special projects. Technical summaries from each research theme are reported. DOE

N83-36536# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES, NO. 29
13 Oct. 1983 74 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84526) Avail: NTIS HC A04

Numerous topics in climatology, atmospheric physics, oceanography, and geophysics are discussed. Modeling of tropical cyclones, ocean-atmosphere systems, stratospheric temperature changes, and stratiform clouds is discussed. Ocean waves, earthquakes, atmospheric composition, and carbon doxide concentration are among other topics discussed. For individual titles, see N83-36537 through N83-36537.

N83-36537# Joint Publications Research Service, Arlington, Va. **c47**
COSMIC HORIZONS IN CLIMATOLOGY
Kirill Yakovlevich Kondratyev *In its* USSR Rept.: Earth Sci., No. 29 (JPRS-84526) 13 Oct. 1983 p 1-15 refs Transl. into ENGLISH from Priroda (Moscow), no. 4, Apr. 1983 p 23-33 Previously announced as A83-31315 (For primary document see N83-36536 24-42)
Avail: NTIS HC A04

Factors that might affect the Earth's climate to the year 2000 are examined with emphasis on the energetically active zones of the ocean and the greenhouse effect. The use of satellites for purposes of climate monitoring is discussed, and climate monitoring from the Salyut and Soyuz spacecraft is examined. It is noted tht satellite observations may be able to provide important information about the effect of atmospheric CO2 concentrations on climate. Also considered is the possibility of a global ecological monitoring program, and the possibility of studying the climate of other planets (especially Mars and Venus). Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N83-36538*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STUDY ON SPECTRAL/RADIOMETRIC CHARACTERISTICS OF THE THEMATIC MAPPER FOR LAND USE APPLICATIONS Quarterly Status and Technical Progress Report, 21 Jun. - 20 Sep. 1983
William A. Malila, Michael D. Metzler, Principal Investigators, and Eric P. Crist 26 Sep. 1983 52 p refs ERTS

(Contract NAS5-27346)
(E83-10409; NASA-CR-174539; NAS 1.26:174539; ERIM-164000-4-T; QSTPR-4) Avail: NTIS HC A04/MF A01 CSCL 08B

Previous characterization of scan-related low-frequency noise was extended and refined through detailed analysis of shutter calibration data on CCT-ADDS tapes and reflective-band data from nighttime acquisitions. A recommended correction procedure was identified that uses calibration shutter data both as a diagnostic and to obtain correction values. Through comparison of coincident TM and MSS data, illustrations of the added information content of TM data for agricultural applications were developed. The capability of improved spatial resolution to better define boundaries and to resolve spatial details is shown. Spectral analysis of tasseled-cap transformations of TM and MSS data shows high correlation between greenness features, greater signal range for TM, and indications that a subset of TM bands could accurately simulate MSS data, if required. M.G.

N83-36539*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APERTURE SYNTHESIS FOR MICROWAVE RADIOMETERS IN SPACE
D. M. LeVine and J. C. Good Aug. 1983 37 p refs Submitted for publication
(NASA-TM-85033; NAS 1.15:85033) Avail: NTIS HC A03/MF A01 CSCL 14B

A technique is described for obtaining passive microwave measurements from space with high spatial resolution for remote sensing applications. The technique involves measuring the product of the signal from pairs of antennas at many different antenna spacings, thereby mapping the correlation function of antenna voltage. The intensity of radiation at the source can be obtained from the Fourier transform of this correlation function. Theory is presented to show how the technique can be applied to large extended sources such as the Earth when observed from space. Details are presented for a system with uniformly spaced measurements. Author

N83-36540# Defense Logistics Studies Information Exchange, Fort Lee, Va. Hydrographic/Topographic Center.
USE OF LANDSAT FOR NAVIGATION PRODUCTS AT DMA (DEFENSE MAPPING AGENCY) Final Report
Elizabeth B. James May 1983 14 p refs Presented at the 39th Ann. Meeting of the Inst. of Navigation, Houston, Tex., 21-23 Jun. 1983
(AD-A129079) Avail: NTIS HC A02/MF A01 CSCL 08/2

LANDSAT exploitation for hydrographic support has been under study and in use on a limited scale for some time. The Defense Mapping Agency (DMA) has found LANDSAT's multispectral scanner imagery particularly useful in augmenting the completeness of its products. Recently, a program has been implemented using this remotely sensed imagery in routinely updating and maintaining nautical charts and publications. This paper provides a general description of the LANDSAT system and applications at DMA as well as limitations of its use in navigation. Author (GRA)

N83-36541# Pattern Analysis and Recognition Corp., New Hartford, N.Y.
AUTOMATIC FEATURE EXTRACTION SYSTEM NO. 2 Final Technical Report, 22 Dec. 1980 - 15 Dec. 1982
John C. Leitz, James L. Cambier, Michael S. Crone, Robert Fries, Michael A. Gennert, Gerald J. Kinn, John F. Lemmer, and Patricia M. Lentz Griffiss AFB, N.Y. RADC Jan. 1983 154 p
(Contract F30602-81-C-0034; AF Proj. 3205)
(AD-A130126; RADC-TR-83-22; PAR-82-19) Avail: NTIS HC A08/MF A01 CSCL 20/6

This report documents the development of the Automatic Feature Extraction System delivered to the Defense Mapping Agency. This effort has provided an advanced development model of a semi-automatic interactive system capable of generating data files to support mapping, charting and geodesy products from digital source inputs and a flexible test bed to permit experimentation for addressing the long range image processing requirements of the Defense Mapping Agency. Author (GRA)

N83-36542# Naval Coastal Systems Center, Panama City, Fla.
GROUND TRUTH ANALYSIS SUPPORTING THE HIGH RESOLUTION FLYOVER
Daniel F. Lott Mar. 1983 49 p refs
(AD-A130026; AD-F200051; NCSC-TM-370-83) Avail: NTIS HC A03/MF A01 CSCL 08/3

Ground truth measurements were collected during high resolution flyover tests designed to maximize resolution of a multispectral scanner. Tests were conducted on 27 and 31 August and 1 September 1981 at sites providing different water mass types and bottom reflectances. Measurements of water level, wave heights, surface and water column temperatures, wind speed and direction, solar radiation, diffuse and beam attenuation coefficient, and secchi depth were obtained. The environmental conditions which affected scanner performance are summarized. Author (GRA)

N83-36543# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Aerospace Cartography Dept.
MEASURING THE FRACTAL DIMENSIONS OF SURFACES FOI MF
Mark C. Shelberg, Nina Lam (Ohio State Univ.), and Harold Moellering (Ohio State Univ.) 16 Oct. 1983 11 p refs Presented at the 6th Auto-Carto, Ottawa, Canada, 16-21 Oct. 1983
(AD-A129664) Avail: NTIS HC A02/MF A01 CSCL 12/1

The fractal dimension of a surface is a measure of its geometric complexity and can take on any non-integer value between 2 and 3. Normally, the topological dimension of surfaces is 2; however, their fractal dimensions increase with greater amounts of complexity or roughness. For example, a fractal dimension of 2.3 is found to be a common value in describing the relief on the earth. This paper discusses and presents examples of an algorithm designed to measure the fracticality of surfaces. The algorithm was developed at The Ohio State University and is shown to be reliable and robust. It is placed in an interactive setting and is based on the premise that the complexity of isarithm lines may be used to approximate the complexity of a surface. The algorithm operates with the following scenario: Starting with a matrix of Z-heights, an isarithm interval is selected and isarithm lines are constructed on the surface. A fractal dimension is computed for each isarithm line by calculating their lengths over a number of sampling intervals. The surface's fractal dimension is the result of averaging the fractal dimensions of all the isarithm lines and adding 1. Potential applications for this technique include a new means for data compression, a quantitative measure of surface roughness, and be used for generalization and filtering. Author (GRA)

N83-36544# High Life Helicopters, Inc., Puyallup, Wash. qa6-45588
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, ARIZONA. VOLUME 2A: CAMERON A DETAIL AREA Final Report
1983 536 p Prepared in cooperation with QEB, Inc.
(Contract DE-AC13-79GJ-01692)
(DE83-012989; GJBX-25-83-Vol-2A(CAA)) Avail: NTIS HC A23/MF A01

Appendices for: stacked profiles; geologic histograms; and geochemical histograms are presented. Speed and altitude histograms; geologic statistical tables; geochemical statistical tables; magnetic and ancillary profiles; and test line data are also included. DOE

N83-36545# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGETOMETER SURVEY, DURANGO B, COLORADO. VOLUME 2A: DETAIL AREA Final Report
1983 422 p refs Prepared in cooperation with QEB, Inc., Lakewood, Colo.
(Contract DE-AC13-79GJ-01692)
(DE83-014823; GJBX-31-83-Vol-2A(DB)) Avail: NTIS MF A01

The geology of the Durang B detail area, radioactive mineral occurrences in Colorado, and geophysical data interpretation are considered. Appendices contain: stacked profiles, geologic histograms, geochemical histograms, speed and altitude histograms, geologic statistical tables, geochemical statistical tables, and test line data. DOE

N83-36546*# New Mexico Univ., Albuquerque. Technology Application Center.
LANDSAT MONITORING OF IRRIGATED FARMLAND ACREAGE IN CURRY COUNTY, NEW MEXICO
Michael Inglis and Thomas K. Budge Feb. 1983 49 p refs Sponsored by NASA Prepared in cooperation with New Mexico State Univ., Las Cruces Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract DI-14-34-0001-1133)
(E83-10312; NASA-CR-174457; NAS 1.26:174457; PB83-220566; WRRI-165; W83-03310; OWRT-A-069-NMEX(1)) Avail: NTIS HC A03/MF A01 CSCL 08H

Curry County, New Mexico, was selected as the study area to test the applicability of LANDSAT satellite digital data in making accurate acreage measurements of irrigated cropland. Three LANDSAT digital images of the 1981 growing season were classified for Curry County to determine (1) how well Landsat classified irrigated lands in the area; (2) how accurate Landsat acreage measurements could be; and (3) how many LANDSAT overpass dates would be required to accurately measure irrigated acreage. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N83-36547*# Engelhard Corp., Menlo Park, Calif. Research and Development Dept.
PHOSPHORIC ACID FUEL CELL STACK AND SYSTEM DEVELOPMENT Final Technical Report
A. Kaufman Oct. 1981 206 p
(Contract DE-AC01-78ET-15366)
(NASA-CR-172861; NAS 1.26:172861) Avail: NTIS HC A10/MF A01 CSCL 10B

The development of phosphoric acid fuel cell stack components, fuel selection and processing, integrated system design and development, and large stack design and development were examined. Author

N83-36548*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
LOW CONCENTRATION RATIO SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 kW APPLICATION. VOLUME 1: DESIGN, ANALYSIS AND DEVELOPMENT TESTS Final Report
Jul. 1983 201 p refs
(Contract NAS8-34214)
(NASA-CR-170869; NAS 1.26:170869; SSD-83-0075-1) Avail: NTIS HC A10/MF A01 CSCL 10A

A preliminary design effort directed toward a low concentration ratio photovoltaic array system capable of delivering multihundred kilowatts (300 kW to 1000 kW range) in low earth orbit is described. The array system consists of two or more array modules each capable of delivering between 113 kW to 175 kW using silicon solar cells or gallium arsenide solar cells, respectively. The array module deployed area is 1320 square meters and consists of 4356 pyramidal concentrator elements. The module, when stowed in the Space Shuttle's payload bay, has a stowage volume of a cube with 3.24 meters on a side. The concentrator elements are sized for a geometric concentration ratio (GCR) of six with an aperture area of .25 sq. m. The structural analysis and design trades leading to the baseline design are discussed. It describes the configuration, as well as optical, thermal and electrical performance analyses that support the design and overall performance estimates for the array are described. Author

N83-36549*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF POTENTIAL BENEFITS OF INTEGRATED-GASIFIER COMBINED CYCLES FOR A UTILITY SYSTEM
Yung K. Choo Oct. 1983 21 p
(NASA-TP-2172; E-1465; NAS 1.60:2172) Avail: NTIS HC A02/MF A01 CSCL 10B

Potential benefits of integrated gasifier combined cycle (IGCC) units were evaluated for a reference utility system by comparing long range expansion plans using IGCC units and gas turbine peakers with a plan using only state of the art steam turbine units and gas turbine peakers. Also evaluated was the importance of the benefits of individual IGCC unit characteristics, particularly unit efficiency, unit equivalent forced outage rate, and unit size. A range of IGCC units was analyzed, including cases achievable with state of the art gas turbines and cases assuming advanced gas turbine technology. All utility system expansion plans that used IGCC units showed substantial savings compared with the base expansion plan using the steam turbine units. Author

N83-36550# Naval Civil Engineering Lab., Port Hueneme, Calif.
A 20-KW WIND ENERGY CONVERSION SYSTEM (WECS) AT THE MARINE CORPS AIR STATION, KANEOHE, HAWAII Progress Report, Sep. 1978 - Dec. 1981
D. Pal Jan. 1983 69 p refs
(AD-A128761; NCEL-TN-1655) Avail: NTIS HC A04/MF A01 CSCL 10/2

The wind turbine generator chosen for the evaluation was a horizontal-axis-propeller-downwind rotor driving a three-phase, self-excited alternator through a step-up gear box. The alternator is fed into the base power distribution system through a three-phase, line-communtated-synchronous inverter using SCRs. The site has moderate wind conditions with an annual average windspeed of 12 to 14 mph, and the WECS turbine has a relatively high (29 mph) rated windspeed. The 20-kW WECS systems was primarily designed to obtain operating experience with, and maintenance information on, a 20-kW-sized WECS. This report describes in detail the experience gained and lessons learned during the field evaluation. GRA

N83-36551# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COPPERHEAD BATTERY TESTER
William J. Cruickshank Jun. 1983 49 p
(DA Proj. 1L1-62618-AH-80)
(AD-A129503; AD-F300261; ARBRL-MR-03275) Avail: NTIS HC A03/MF A01 CSCL 10/3

The development of a tester for the control section battery of the M712 Cannon-Launched Guided Projectile has fulfilled a requirement for the automatic testing of a series of batteries. The tester is a self-contained instrument that is used with a shock test system to rapidly perform complete tests after an initial setup. GRA

N83-36552# Gould, Inc., Rolling Meadows, Ill. Materials Lab.
STUDIES LEADING TO THE DEVELOPMENT OF HIGH-RATE LITHIUM-SULFURYL CHLORIDE BATTERY TECHNOLOGY Final Report, 1 Sep. 1981 - 31 Aug. 1982
John C. Hall, Mark Kock, and Farug Marikar Dec. 1982 163 p refs
(Contract DAAK20-81-C-0420; DA Proj. 1L1-62705-AH-94)
(AD-A129564; DELET-TR-81-0420-2; REPT-827-055) Avail: NTIS

HC A08/MF A01 CSCL 10/3
Batteries built with an inorganic catholyte (e.g., thionyl chloride and sulfuryl chloride) are of interest for military applications on the basis of their high demonstrated energy density and high discharge rate capability when compared with organic electrolyte lithium cells. By far the greatest attention has been given to the lithium-thionyl chloride (Li/SOCl2) system; cells and batteries have been demonstrated with energy densities in excess of 600Wh/kg (1). Less attention has been given to the development of lithium-sulfuryl chloride batteries possibly because of a somewhat lower theoretical energy density (1700 and 1500 Wh/kg for Li/SOCl2 and Li/SO2Cl2 respectively). Author (GRA)

N83-36553# United Technologies Corp., South Windsor, Conn. Power Systems Div.
MEGAWATT FUEL CELL SYSTEMS ANALYSIS Final Report, Sep. 1981 - Jul. 1982
John C. Trocciola Wright-Patterson AFB, Ohio AFWAL Feb. 1983 66 p refs
(Contract F33600-81-C-0582; AF Proj. 3145)
(AD-A129398; AFWAL-TR-83-2013; PSD/UTC-FCR-4513) Avail: NTIS HC A04/MF A01 CSCL 10/2

This analysis effort evaluated the operational and economical benefits of utilizing a megawatt fuel cell to provide prime electrical power and thermal energy to an Air Force Logistics Center. Issues motivating this analysis include concerns with the Air Logistics Center's vulnerability to electrical grid and fuel supply disruption, and energy conservation/self sufficiency goals established by the Air Force Logistics Command. This effort determined that megawatt fuel cells can provide an economical alternative for survivable power systems when compared to electrical grid/diesel boiler systems currently used. Author (GRA)

N83-36554# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ON-SITE FUEL CELL APPLICATION ANALYSIS Final Report, Sep. 1981 - Dec. 1982
Joseph W. Staniunas Wright-Patterson AFB, Ohio AFWAL Feb. 1983 79 p refs
(Contract F33615-81-C-0582; AF Proj. 3145)
(AD-A129388; AFWAL-TR-83-2014; PSD/UTC-FCR-4513-1) Avail: NTIS HC A05/MF A01 CSCL 12/1

This program evaluated the energy conservation and economic potential of on-site fuel cell service for Air Force Logistic Command Facilities. Numerous facilities were examined at Wright-Patterson AFB, Hill AFB, and Robins AFB. One facility was selected at each base for detailed benefit and integration analyses. Results of the analyses are presented. Author (GRA)

N83-36555# Bechtel Corp., San Francisco, Calif.
INTEGRATED STRUCTURE DESIGNS FOR PHOTOVOLTAIC ARRAYS
H. A. Franklin Apr. 1983 254 p refs
(Contract DE-AC04-76DP-00789)
(DE83-013143; SAND-81-7191) Avail: NTIS HC A12/MF A01

The third phase of a multiyear program to investigate the design of low cost support structures for solar photovoltaic arrays used for central power production is described. Two low cost candidate support concepts were investigated. Detailed design integration was investigated. Design integration involved detailing various foundation and superstructure systems to reduce structural redundancy and improve system efficiency for fabrication and installation. Wind tunnel tests of the fixed, flat panel arrays were made. The structural responses and aerodynamic stability of candidate designs were checked by wind dynamic analyses. The fabrication and installation of a nonoperative demonstration array in Albuquerque, NM, which shows the simplicity and effectiveness of the selected design for future large scale applications is outlined. DOE

N83-36556# Sandia Labs., Albuquerque, N. Mex.
TECHNICAL ASPECTS OF FUTURE PHOTOVOLTAIC-POWER SYSTEMS
Gary J. Jones 1983 20 p refs Presented at the Am. Solar Energy Soc. Meeting, Minneapolis, 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012868; SAND-83-1284C; CONF-830622-10) Avail: NTIS HC A02/MF A01

Future photovoltaic systems which will need to be designed to increase acceptance by the potential system owner and the host utility are discussed. The systems will maximize their output of high signal quality electricity to the utility through a safe and controlled interconnection, while minimizing the total cost. These systems will emphasize the use of modular array field designs and state of the art power conditioning equipment in all applications and tracking collectors wherever practical. The systems will be designed as a supplier of energy to the utility and only in the residential case will PV be colocated with a load. The major remaining hardware developments necessary to obtain these systems are the modular residential array design, modular tracking flat panel field development, and central station power conditioning definition. DOE

N83-36557# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
RESPONSE OF THE MOD-OA WIND-TURBINE ROTOR TO TURBULENT ATMOSPHERIC WIND
R. W. Thresher, W. E. Holley, E. L. Hershberg, and Shuh-Ren Lin Dec. 1982 117 p refs
(Contract DE-AT06-82RL-10378)
(DE83-011844; DOE/RL-10378-82/1) Avail: NTIS HC A06/MF A01

The fluctuating loads caused by the atmospheric turbulence are described. The wind turbulence inputs are determined in three basic modeling steps: (1) the turbulent velocity field is characterized by a model which provides the correlation between velocity components at different spatial positions and at different times; (2) the velocity field is approximated in the rotor disk plane using a series expansion which includes terms that are uniform across the rotor disk, gradient terms which vary linearly across the disk, and terms which vary quadratically across the disk, all of these terms are time dependent; (3) simple rational spectral representations are determined which approximate the derived correlation model for these turbulence components. The correlation between velocities at spatially separated points is characterized by the Von Karman model. Quasisteady linear aerodynamic theory is used to compute the forces on the rotor blades of the Mod-OA wind turbine operating in a turbulent flow. The blade used for these computations is the fiberglass blade in place on the Mod-OA turbine. The turbulence and aerodynamic model are combined and the following rotor responses are computed: thurst, torque, pitch and yaw moments, and blade root bending moments. These computations were made for the case of fixed pitch operation and incorporate the influence of a linear mean wind shear. Results presented include power spectral density plots of the wind and turbine outputs for three different mean wind conditions. The various responses are compared to determine the relative importance of the turbulence inputs on rotor blade loads. DOE

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N83-36558# Air Force Systems Command, Vandenberg AFB, Calif. Directorate of Civil Engineering.
SUPPLEMENT TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT, SPACE SHUTTLE PROGRAM, VANDENBURG AFB, CALIFORNIA Final Report
Jul. 1983 753 p refs
Avail: NTIS HC A99/MF A01

New or revised action aspects are examined for significant effects on the environment of Vandenberg and surrounding areas. Major impacts include cutting through a portion of one archaelologi-

cal site at Vandenberg AFB; removing one of three structures from a historically significant Coast Guard Station; and causing extensive, although temporary, disruption of two acres of subtidal habitat and one third acre of intertidal habitat during construction of a barge landing facility. The impacts on archaeological and historical resources will be satisfactorily mitigated by data recovery on archaeological sites and by archival documentation and preservation of historical facilities. Impacts to the marine environment will be minimized through appropriate construction and operation procedures as well as planned mitigation measures.
Author

N83-36559# North Dakota State Univ., Fargo. Dept. of Zoology.
IDENTIFICATION AND QUANTIFICATION OF THE WATER SOLUBLE COMPONENTS OF JP-4 AND A DETERMINATION OF THEIR BIOLOGICAL EFFECTS UPON SELECTED FRESHWATER ORGANISMS Annual Technical Report, 30 Sep. 1981 - 29 Sep. 1982
J. D. Brammer and R. L. Puyear 23 Dec. 1982 161 p refs
(Grant AF-AFOSR-3709-78; AF Proj. 2312)
(AD-A129526; AFOSR-83-0513TR) Avail: NTIS HC A08/MF A01 CSCL 21/4

This phase of the research entailed: I. Repeating and completing work on water solubilities of major JP-4 jet fuel alkylbenzenes at five different temperatures and four different salinities. Work is nearly complete for determining the maximal water solubilities of JP-4 derived alkylbenzenes. II. LC50 and MATC for toluence in fathead minnow embryos, 1-day posthatch protolarvae and 30-day old fish has been published. III. Metabolism of benzene and toluene, aminopyrine demethylase and aniline hydroxylase activities by liver subcellular fractions from control and induced rats activities. IV. Toluene metabolism and activities of aminopyrine demethylase and aniline hydroxylase in the lier of Bluegill sunfish Lepomis ssp. V. Bioaccumulation and tissue distribution of 14C benzene and 14C toluene by fathead minnows in a closed static bioassay system. VI. The prehatching development of the fathead minnow. VII. Effects of toluene on the prehatching development of the fathead minnow.
GRA

N83-36560# California Univ., Livermore. Lawrence Livermore Lab.
ATMOSPHERIC DISPERSION OF AMMONIA: AN AMMONIA FOG MODEL
Edward J. Kansa, Howard C. Rodean, Stevens T. Chan, and Donald L. Ermak 1983 24 p refs Presented at the 21st ASME/AIChE Natl. Heat Transfer Conf., Seattle, 24 Jul. 1983
(Contract W-7405-eng-48)
(DE83-007354; UCRL-88649; CONF-830702-7) Avail: NTIS HC A02/MF A01

The necessity of adding the partial differential equations for mass, momentum, and energy for the ammonia in the liquid phase was circumvented by certain assumptions. It is assumed that the ammonia behaves as an ideal gas including the droplets. A temperature dependent molecular weight was introduced to simulate the transition from a vapor droplet cloud to a pure vapor cloud of ammonia. Likewise, the vaporization of ammonia was spread out over a temperature range. Mass, momentum, energy, and total ammonia is conserved rigorously. The observed features of the ammonia spill simulation have pointed out phenomena that could not be predicted in simpler calculations. Perhaps the most obvious feature is the cloud bifurcation due to the strength of the gravity current relative to the ambient wind. The gravity spreading of the denser ammonia fog significantly perturbs the unidirectional windfield in the vicinity of the spill, setting up complex eddy patterns in the cloud which are enhanced by ground heating and warm dry air entrainment.
DOE

N83-36561# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
ENERGY RELATED ENVIRONMENTAL STUDIES Annual Progress Report for period ending 30 Sep. 1982
Apr. 1983 253 p refs
(Contract W-7405-eng-26)
(DE83-010394; ORNL-5999; ESDP-2090) Avail: NTIS HC A12/MF A01

Separate abstracts were prepared for 12 of the 14 sections of the Environmental Sciences Division annual progress report. The other 2 sections deal with educational activities. The programs discussed deal with advanced fuel energy, toxic substances, environmental impacts of various energy technologies, biomass, low-level radioactive waste management, the global carbon cycle, and aquatic and terrestrial ecology.
DOE

N83-36562# Clarkson Coll. of Technology, Potsdam, N.Y.
ASSESSMENT OF THE ECONOMIC MAGNITUDE OF ENVIRONMENTAL DAMAGE FROM ACID PRECIPITATION IN THE ADIRONDACKS
Fredrick C. Menz and John K. Mullen May 1983 14 p refs
(Contract DI-14-34-0001-1252)
(PB83-208553; W83-03095; OWRT-B-103-NY(1)) Avail: NTIS HC A02/MF A01 CSCL 13B

This research represents one of few initial attempts to quantify economic damages resulting from increased acidification of lakes and ponds ostensibly due to acidic deposition. The Adirondack mountains have been identified as one of the most impacted and vulnerable areas in the northeastern U.S. to suffer acidification damages to its aquatic ecosystem. The focus of this research is the loss in economic welfare resulting from diminished recreational angling opportunities within the Adirondack fishery. An amended travel-cost model was applied to a survey of licensed anglers in New York State to determine the economic value of the fishery prior to the general acknowledgement of widespread acidification damages.
Author (GRA)

N83-36563# Aerocomp, Inc., Costa Mesa, Calif.
PTPLU: A SINGLE SOURCE GAUSSIAN DISPERSION ALGORITHM. USER'S GUIDE Final Report
Thomas E. Pierce, D. Bruce Turner, Joseph A. Catalano, and Frank V. Hale, III Aug. 1982 113 p refs
(Contract EPA-68-02-3442)
(PB83-211235; EPA-600/8-82-014) Avail: NTIS HC A06/MF A01 CSCL 13B

PTPLU (from PoinT PLUme) is an improved model for estimating the location of the maximum short term concentration from a single point source as a function of stability and wind speed. The algorithm is similar to PTMAX which was first released in May 1973. Among the improvements of this version are options for the estimation of gradual plume rise, stack downwash, and buoyancy-induced dispersion. This document describes the input, processing, and output of both the batch and interactive versions of the program.
Author (GRA)

N83-36564# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Monitoring Systems Lab.
NATIONAL PERFORMANCE AUDIT PROGRAM. AMBIENT AIR AUDITS OF ANALYTICAL PROFICIENCY, 1981
Berne I. Bennett, Robert L. Lampe, Linda F. Porter, Avis P. Hines, and John C. Puzak Apr. 1983 43 p refs
(PB83-210633; EPA-600/4-83-009) Avail: NTIS HC A03/MF A01 CSCL 14B

The results of the National Audit Program are summarized by pollutant and by analytical method. Semiannual audits were conducted for SO2 and NO2 (bubbler methods), Pb, NO3(negative 2) and SO4(negative 2) (filter strips) and CO (continuous monitors)2. One audit was conducted on high volume flow rate. Continuous SO2 monitors were audited throughout the year, such that no monitor was audited more than once. Approximately 60 laboratories participated in each SO2 bubbler audit and 50 in each NO2 bubbler audit. Approximately 60 laboratories participated in each SO4 (negative 2) audit, 50 in each NO3(negative 2) audit and 97 in each Pb audit. Approximately 380 CO monitors were checked in each CO audit and 159 continuous SO2 monitors were checked throughout the year.
GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N83-36565 California Univ., Los Angeles.
AURORAL-ZONE PLASMA DYNAMICS Ph.D. Thesis
David John Gorney 1982 153 p
Avail: Univ. Microfilms Order No. DA8306043

Analysis of the USAF S3-3 charged particle data and electric field observations has provided extensive quantitative understanding of the auroral particle acceleration process. The results of an effort to use energetic charged particle observations to probe the altitude profile of auroral electric potential structures by applying adiabatic mapping theory are presented here. In situ energetic charged particle measurements differ from local electric field observations in that charged particles execute dynamic trajectories along the magnetic field lines and retain information on the spatial electric potential distribution in their velocity space distribution function. Although a unique determination of the potential distribution is not possible, basic differences between local or non-local acceleration are readily apparent in the particle observations. Specifically, this study shows that a large scale auroral electric field exists at all times in the evening sector with an altitude distribution that is fairly unstructured at altitudes near and above one earth radius. Significant parallel potential drop is not observed below about 4000 kilometers altitude. Dissert. Abstr.

N83-36566 Michigan Univ., Ann Arbor.
THEORY AND OBSERVATIONS OF THE LOW- AND MID-LATITUDE IONOSPHERE Ph.D. Thesis
Michael Owens Chandler 1982 176 p
Avail: Univ. Microfilms Order No. DA8304459

Measured and calculated values of electron concentration, electron temperature and ion temperature in the low and mid latitude ionosphere are presented and discussed. The existence of horizontal, spatial gradients in electron temperature above Arecibo, Puerto Rico is shown. The gradients were northward with maximum values of about 1.5 K km. The ionosphere model was tested by comparison with another theoretical model and with observations. The tests show that the model values of electron concentration are in agreement with the observations, but that the model electron temperatures are too low. An increase in the model electron heating rate by a factor of 1.5 to 4 is shown to result in better agreement. The suggestion is made that the photoelectron transport equations are incorrect in calculating the photoelectron flux at low energies. The possibility of an error in the electron cooling rate due to interactions with positive ions could not be ruled out. Dissert. Abstr.

N83-36567 Pennsylvania State Univ., University Park.
AN OBSERVATIONAL STUDY OF WATER VAPOR IN THE MID-LATITUDE MESOSPHERE Ph.D. Thesis
Richard Michael Bevilacqua 1982 224 p
Avail: Univ. Microfilms Order No. DA8305615

Ground based spectral line measurements of the 22.2 GHz water vapor emission line have been used to deduce the mesospheric water vapor profile. The measurements have been obtained on a low noise maser receiver system. In the data analysis procedure, an average spectrum is formed for each observing session by integration of all the spectral data obtained during the session. Inversion of these total period spectra yield the average distribution of mesospheric water vapor during the observing sessions. In addition, it has been found that signal to noise ratios achieved after about twelve hours of integration are generally sufficient to produce spectral inversions. Therefore, the data has also been separately integrated into approximate day night, twelve hour period spectra, each of which has been inverted. The results of the total period retrievals generally indicate that the water vapor mixing ratio is either indepedent of altitude or increasing slowly in the 50 to 60 km range with typical values of between 5 and 8 ppmv. Dissert. Abstr.

N83-36568*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FLUID SIGNATURES OF ROTATIONAL DISCONTINUITIES AT EARTH'S MAGNETOPAUSE
Jack D. Scudder Sep. 1983 27 p refs Submitted for publication
(NASA-TM-85097; NAS 1.15:85097) Avail: NTIS HC A03/MF A01 CSCL 04A

Fluid signatures in the MHD approximation at rotational discontinuities (RD) of finite width called rotational shear layers (RSL) are examined for general flow and magnetic geometries. Analytical and geometrical arguments illustrate that the fluid speed can either go up or down across an RSL for a fixed normal mass flux. The speed profile may or may not be monotonic depending on the boundary conditions. The flow velocity may or may not be field aligned or "jetting" as a result of traversing the RSL. In general, significant "convection" is expected in the layer. The observable signatures of (MHD) RSL's depend on 7 (boundary condition) parameters are (1) the mass density, (2 to 5) the incident normal and transverse components of the magnetic field and fluid velocity, (6) the angle epsilon between the incident tangential flow velocity and tangential magnetic field, and (7) the size of the magnetic angular rotation implemented by the layer delta phi. Author

N83-36569*# Texas Univ., Dallas. Center for Space Sciences.
PLANAR ION TRAP (RETARDING POTENTIAL ANALYZER) EXPERIMENT FOR ATMOSPHERE EXPLORER Final Report
W. B. Hanson, S. Sanatani, C. R. Lippincott, and D. R. Zuccaro Dec. 1982 7 p refs
(Contract NAS5-11407)
(NASA-CR-170589; NAS 1.26:170589) Avail: NTIS HC A02/MF A01 CSCL 04A

The retarding potential analyzer and drift meter were carried aboard all three Atmosphere Explorer spacecraft. These instruments measure the total thermal ion concentration and temperature, the bulk thermal ion velocity vector and some limited properties of the relative abundance of H(+), He(+), O(+) and molecular ions. These instruments functioned with no internal failures on all the spacecraft. On AE-E there existed some evidence for external surface contamination that damaged the integrity of the RPA sweep grids. This led to some difficulties in data reduction and interpretation that did not prove to be a disastrous problem. The AE-D spacecraft functioned for only a few months before it re-entered. During this time the satellite suffered from a nutation about the spin axis of about + or - 2 deg. This 2 deg modulation was superimposed upon the ion drift meter horizontal ion arrival angle output requiring the employment of filtering techniques to retrieve the real data. Author

N83-36570# Air Force Geophysics Lab., Hanscom AFB, Mass.
(?) THE AIR FORCE GEOPHYSICS LABORATORY: AERONOMY, AEROSPACE INSTRUMENTATION, SPACE PHYSICS, METEOROLOGY, TERRESTRIAL SCIENCES AND OPTICAL PHYSICS Interim Scientific Report
Alice B. McGinty Apr. 1982 226 p
(AF Proj. 9993)
(AD-A126004; AFGL-TR-82-0132; SR-230) Avail: NTIS HC A11/MF A01 CSCL 05/1

Contents: The Air Force Geophysics Laboratory; Aeronomy Division--Upper Atmosphere Composition, Middle Atmosphere Effects, Atmospheric UV Radiation, Satellite Accelerometer Density Measurement, Theoretical Density Studies, Chemical Transport Models, Turbulence and Forcing Functions, Atmospheric Ion Chemistry, Energy Budget Campaign, Kwajalein Reference Atmospheres, 1979, Satellite Studies of the Neutral Atmosphere, Satellite Studies of the Ionosphere, Aerospace Instrumentation Division--Sounding Rocket Program, Satellite Support, Rocket and Satellite Instrumentation; Space Physics Division--Solar Research, Solar Radio Research, Environmental Effects on Space Systems,

Solar Proton Event Studies, Defense Meteorological Satellite Program, Ionospheric Effects Research, Spacecraft Charging Technology; Meteorology Division--Cloud Physics, Ground-Based Remote-Sensing Techniques, Mesoscale Observing and Forecasting, Design Climatology, Aircraft Icing Program, Atmospheric Dynamics; Terrestrial Sciences Division--Geodesy and Gravity, Geokinetics; Optical Physics Division--Atmospheric Transmission, Remote Sensing, INfrared Background; and Appendices. GRA

N83-36571# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
WEIGHTING FOR THE MODULATION TRANSFER FUNCTION M.S. Thesis
Robert James Flenniken Jun. 1983 45 p refs
(AD-A128993) Avail: NTIS HC A03/MF A01 CSCL 04/1

The effects of turbulence on the performance of imagers or on beam forming, optical systems are well expressed by the optical transfer function (OTF) or its magnitude, the modulation transfer function (MTF). It has been shown that the MTF can be expressed in terms of the Fried model by means of a single number, the turbulence structure constants for optical index, C sub n to the 2nd power, provided that a properly path weighted value is obtained. Based on current theory the weighting needed in the path-position weighted value of C sub n to the 2nd power is a function of (z/z sub 0) raised to the 5/3 power, heavily emphasizing the region near the imaging system or beam forming optics. It is the conclusion of this report, that the path weighting function (Z sub 0) raised to the 5/3 power is correct. Author (GRA)

N83-36572# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
AN EXPERIMENTAL STUDY OF ATMOSPHERE-IONOSPHERE COUPLING USING MAGNETOMETERS Final Technical Report, 15 Feb. - 15 Nov. 1982
Janet G. Luhmann and Paul J. Coleman, Jr. Nov. 1982 13 p refs
(Grant AF-AFOSR-0193-82; ARPA Order 4513; AF Proj. 2309)
(AD-A130057; AFOSR-83-0571TR) Avail: NTIS HC A02/MF A01 CSCL 04/1

On three occasions, portable magnetometer experiments with automated data systems designed especially for unsupervised operation were sited within a 50 km radius of underground nuclear tests at the Nevada Test Site. The purpose of these experiments was to determine whether the disturbance of the atmosphere by the ground movement related to the test created a measurable perturbation current in the ionosphere. Preliminary analyses of the results suggest that the natural ULF magnetic background is too noisy to allow the certain identification of a test-related signal by visual inspection of chart records. However, more sophisticated computerized methods can be applied to identify small differences in magnetic fields measured at several sites. The negative result reported here is thus qualified to the extent that we have not made use of these more sensitive data analysis tools. GRA

N83-36573# Tasmania Univ., Hobart (Australia). Dept. of Physics.
THE ACCESS OF ENERGETIC CHARGED PARTICLES TO SATELLITE ALTITUDES Final Report, 1 Jul. 1980 - 31 Mar. 1982
J. E. Humble 31 May 1982 30 p
(Grant AF-AFOSR-0232-80; AF Proj. 2311)
(AD-A130122; AFGL-TR-83-0195) Avail: NTIS HC A03/MF A01 CSCL 04/1

The ability of energetic charged particles to arrive at a particular location within the magnetosphere from a particular direction is characterised by the cut-off rigidity for the location and arrival direction. Cut-off rigidities may be obtained either by interpolation between known cut-offs at adjacent sites and/or directions of arrival, or by the numerical integration of appropriate particle trajectories in a suitable numerical model of the geomagnetic field. This report summarizes research on the calculation of cutoff rigidities for a satellite at 400 km altitude. The report is divided into the following sections: General Cut-off Survey, Asymptotic directions of arrival for very high rigidity particles, Cut-off definitions for below-horizon directions, and Largest zenith angle of arrival. A listing of the publications and presentations resulting from this effort is included. Author (GRA)

N83-36574# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
POTENTIALS AND CHARGES ON CONDUCTING ROCKET SECTIONS Interim Scientific Report
Charles W. Dubs 12 Nov. 1982 36 p refs
(AF Proj. 7661)
(AD-A130143; AFGL-TR-82-0349; AFGL-ERP-805) Avail: NTIS HC A03/MF A01 CSCL 04/1

The potential differences measured between pairs of three rocket conductors hen various ion or electron beams are emitted were analyzed. Approximate values of coefficients of potential, capacity, and induction are calculated. A simple method of measuring them is presented. Approximate formulae are developed for sheath radius and are used to calculate this radius for each of six beam currents. The extended probe is inside the sheath for all of the beam currents except 1 Micro A. The potential of the rear section is close to zero, so is assumed equal to zero, which leads to the absolute potentials of the rocket sections. Approximate formulae are developed to calculate the sheath potential from the charge in the sheath. A fast converging reiteration gives the charge on each conductor, the sheath charge, and the part of the conductor potentials that are due to the sheath. Explanations are given for: (1) the charge on the rear section having the opposite sign of, and a smaller magnitude than that on the forward section; (2) the magnitude of the probe voltmeter reading being less than that of the rear section voltmeter for moderate beam currents, and the same for beam currents way beyond saturation; (3) the ratio of these two voltmeter readings approaching 1 with increasing magnitude of beam current; (4) the potential of the probe being negative for ion emission; (5) the magnitude of the probe potential reaching a maxmum, then approaching zero with increasing magnitude of beam current. GRA

N83-36575*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ELECTRON ACCELERATION BY LANDAU RESONANCE WITH WHISTLER MODE WAVE PACKETS Progress Report
D. A. Gurnett and L. A. Reinleitner 10 May 1983 28 p refs Presented at the Chapman Conf. on Waves in Magnetospheric Plasmas, Kona, Hawaii, 7-11 Feb. 1983 Submitted for publication
(Contract NAS5-26819; Grant NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-173086; NAS 1.26:173086; AD-A129922; U-of-IOWA-83-9) Avail: NTIS HC A03/MF A01 CSCL 04A

Recent observations of electrostatic waves associated with whistler mode chorus emissions provide evidence that electrons are being trapped by Landau resonance interactions with the chorus. In this paper we discuss the trapping, acceleration and escape of electrons in Landau resonance with a whistler mode wave packet. We show that acceleration can occur by both inhomogeneous and dispersive effects. The maximum energy gained is controlled by the points where trapping and escape occur. Large energy changes are possible if the frequency of the wave packet or the magnetic field strength increase between the trapping and escape points. Various trapping and escape mechanisms are discussed. Author (GRA)

N83-36576# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SOURCES OF SURFACE MAGNETIC FIELD VARIABILITY Final Report
W. P. Olson 28 Apr. 1983 44 p
(Contract F49620-81-C-0001; AF Proj. 2311)
(AD-A130168; AFOSR-83-0577TR) Avail: NTIS HC A03/MF A01 CSCL 08/14

The contribution of non-ionospheric currents to the quiet daily variation in the earth's surface magnetic field (the sub Sq variation) is being reexamined. It has been found that the direct use of

magnetospheric magnetic field models to represent the contribution of these currents to the surface field produces large errors. Thus direct integration over the currents was used. The induction problem was addressed and the contribution to sub Sq from currents induced in the earth's crust was determined. The total day to night contribution to sub Sq was found to be a minimum of 12 nanotesla. This contrasts with a measured variation of from 20 to 45 nanotesla. Thus the magnetospheric currents produce from about 1/4 to over 1/2 of the observed pattern. The Birkeland currents also contribute to sub Sq at sub-auroral latitudes. A study was initiated to examine the day to day variability in sub Sq using ground based magnetometer data and direct (satellite observations) of the solar wind. A means for experimentally determining the baseline for sub Sq (and the main field) was developed.
Author (GRA)

N83-36577# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
ELECTRIC FIELDS IN EARTH ORBITAL SPACE Annual Report
W. P. Olson and K. A. Pfitzer May 1983 64 p refs
(Contract N00014-80-C-0796)
(AD-A129842; MDC-H0731) Avail: NTIS HC A04/MF A01 CSCL 04/1

Work accomplished during the past year is reported. We have determined conclusively that a fraction of the magnetosheath plasma routinely has access to the magnetosphere. This entry occurs preferentially along the flanks of the tail and on the polar side of the dayside cusp regions. This entry occurs in the steady state and is responsible for the maintenance of several current state magnetic features. We have continued our involvement with the magnetospheric CDAWS, and have now constructed event models of the magnetic and electric fields for 3 epochs. Our magnetic field models adequately represent the magnetic field over the dayside magnetosphere. However, near midnight at geosynchronous orbit and in the near tail region, there is a large discrepancy between observation and model predictions. We believe that this is caused by the current neglect in the models of the closure of the Birkeland Region 2 currents in the vicinity of the inner edge of the plasma sheet. We have also developed procedures for the mapping of electric fields along magnetic field lines when time varying magnetic fields (and an induced component of the electric field) are present. These procedures are being tested with STARE and GEOS-2 data. Author (GRA)

N83-36578# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.
ATMOSPHERIC CHEMILUMINESCENCE: COCHISE (COLD CHEMICAL INFRARED SIMULATION EXPERIMENT) AND RELATED EXPERIMENTS Final Report, 1 Nov. 1979 - 30 Sep. 1982
R. A. Armstrong, J. P. Kennealy, F. X. Robert, A. Corman, W. T. Rawlins, L. G. Piper, G. E. Caledonia, B. D. Green, H. C. Murphy, J. I. Steinfeld et al 13 Oct. 1982 192 p refs Prepared in cooperation with Physical Sciences, Inc., Andover, Mass., MIT, Cambridge, and Spectral Sciences, Burlington, Mass.
(AF Proj. 2310)
(AD-A130546; AFGL-TR-82-0305; AFGL-PSRP-660) Avail: NTIS HC A09/MF A01 CSCL 04/1

This final report includes: (1) a discussion of the analysis of recent COCHISE data relevant to O3 and NO infrared emission; (2) a review of recent FAKIR measurements on the quenching reactions of N2(A) with O2, O and on the formation of O(1S) in the quenching of N2(A) by O; (3) the development and exercising of a model for the prediction of upper atmospheric NO radiation in quiescent and aurorally excited atmospheres; (4) the design requirements for FACELIF, a flow reactor with laser photoexcitation capabilities; and (5) design criteria for color center laser absorption experiments. Author (GRA)

N83-36579# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.
THE EXCEDE SPECTRAL ARTIFICIAL AURORAL EXPERIMENT: AN OVERVIEW
R. R. ONeil, E. T. Lee, A. T. Stair, Jr., and D. A. Burt 1 Dec. 1982 13 p refs
(AF Proj. 7670)
(AD-A129274; AFGL-TR-82-0365; AFGL-ERP-809) Avail: NTIS HC A02/MF A01 CSCL 04/1

Atomic and molecular emissions from 1600 angstroms to 2800 angstroms and from 1.5 to 22 microns were measured by on-board instruments at altitude range 70 to 128 km. The observed dominant emissions are N2 Wu-Bensch, C02 at 4.3 micron and N0 at 5.4 micron. GRA

N83-36580# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE AFGL (AIR FORCE GEOPHYSICS LABORATORY) SPECTRAL MODEL OF THE MOIST GLOBAL ATMOSPHERE: DOCUMENTATION OF THE BASELINE VERSION Final Report
Stephen Brenner, Chien-Hsiung Yang, and Samuel Y. K. Yee 16 Dec. 1982 63 p refs
(AF Proj. 2310)
(AD-A129283; AFGL-TR-82-0393; AFGL-ERP-815) Avail: NTIS HC A04/MF A01 CSCL 04/1

The baseline version of the AFGL model of the moist global atmosphere is described in detail. The numerical methods include spectral representation in the horizontal, the Arakawa vertical differencing scheme, and the semi-implicit time scheme. For this version, the pre- and postprocessing, the nonlinear normal mode initialization and the parameterized boundary layer processes and moisture physics are adapted from the NMC spectral model. A series of test forecasts indicate that the model performance is comparable to that of similar large-scale models. GRA

N83-36581# Air Force Geophysics Lab., Hanscom AFB, Mass.
SPECTROSCOPIC INVESTIGATION OF LASER-INITIATED LOW-PRESSURE PLASMA IN ATMOSPHERIC GASES
R. A. Armstrong, R. A. Lucht, and W. T. Rawlins 3 Nov. 1982 11 p refs
(AF Proj. 2310)
(AD-A129284; AFGL-TR-82-0367; AFGL-PSRP-663) Avail: NTIS HC A02/MF A01 CSCL 20/5

Laser-initiated breakdown of N2, 02, and Ar has been investigated st sub-atmospheric pressures using a pulsed (10 ns) Nd:yttrium aluminum garnet (Nd:YAG) laser at 1.06 micrometers. Breakdown thresholds have been determined from 3 to 760 torr and spectral analysis of the plasma emission has been carried out over the range 300-600 nm. Sharp spectral features arising from highly excited singly and multiply charged ions are reported, as well as an underlying continuum at intermediate pressure. Time resolved measurements indicate a complex kinetic dynamic optical behavior. Author (GRA)

N83-36582# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
APPLICATION OF A DIRECT METHOD FOR REAL HEIGHT DETERMINATION TO TWO IONOGRAMS
Milton M. Klein 1 Mar. 1983 19 p refs
(AF Proj. 2310)
(AD-A130430; AFGL-TR-83-0064; AFGL-ERP-827) Avail: NTIS HC A02/MF A01 CSCL 14/2

A direct method for determining real height from virtual height data has been applied to two ionograms from data recorded at Boulder, Colorado and Garchy, France. The initial height was obtained by a modification of the one-start procedure of Howe and McKinnis. The real height results obtained from the two ionograms were in good agreement with previously-reported accurate numerical calculations. To provide a simpler procedure for performing the required integration and thus make the present method more rapid and convenient, the virtual height data have been modeled in terms of polynomial governed by a single parameter. The parameter was determined by comparison of the model with the data. The results using the model were in good agreement with those obtained by direct use of the data. The present method affords a simple and convenient means of obtaining

real height from virtual height data, within the accuracy of the experimental data. Author (GRA)

N83-36583# Alaska Univ., Fairbanks. Geophysical Inst.
[INFRASONIC WAVE ANALYSIS] Final Progress Report, 1 Oct. 1981 - 30 Sep. 1982
John V. Olson, Charles R. Wilson, Jefferson Collier, and Bruce N. McKibben 30 Sep. 1982 160 p refs
(Contract F49620-81-C-0091; AF Proj. 2301)
Avail: NTIS HC A08/MF A01 CSCL 08/6

The morphology of mirobaron infrasonic waves as observed in Antarctica is given for 1981 observations from Windless Bight. Application of pure-state filtering to infrasonic array data is described. Off-line frequency domain analysis software is presented for infrasonic wave analysis. Author

N83-36584# California Univ., Livermore. Lawrence Livermore Lab. Earth Sciences Dept.
STUDIES OF EARTH STRESS AND HYDRAULIC FRACTURING WITH APPLICATIONS IN THE STIMULATION OF UNCONVENTIONAL-GAS RESERVOIRS
Merle Hanson and Donald Towse Sep. 1982 9 p refs Presented at the Rock Mech. Workshop on Hydraulic Fracturing Stress Measurements, Monterey, Calif., 1 Jul. 1983
(Contract W-7405-eng-48)
(DE83-002248; UCRL-88166; CONF-830701-1) Avail: NTIS HC A02/MF A01

The mechanics of hydraulic fracturing for enhanced gas recovery were studied. A minifrac technique for stress measurements at coal mines in the Appalachian and Rocky Mountain regions, to be used to help design fracturing techniques to recover gas from gassy coal beds is discussed. It is indicated that fracture propagation is strongly influenced by existing stresses and that the stress gradient in a nonuniform stress field may stop or turn the fracture. Field evidence shows that anisotropic rock properties due to rock fabric can be a major factor in fracture geometry and in calculated stress values. DOE

N83-36585# National Academy of Sciences - National Research Council, Washington, D. C.
GEOLOGY AND OUR FUTURE: SUMMARY OF A WORKSHOP REPORT Final Report
15 Apr. 1983 42 p refs
(Contract DI-14-08-0001-A0078)
(PB83-217950) Avail: NTIS HC A03/MF A01 CSCL 08G

The Geological Sciences Board presents a view of some important developments in modern geological science, highlights specific applications of that science to critical social problems, and suggests how the geological sciences may develop in the future to help meet the expanding needs of a growing society.
Author (GRA)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-36586 Virginia Univ., Charlottesville.
SURFACE OUTFLOWS OF CONVECTIVE STORMS Ph.D. Thesis
Robert Paul Addis 1983 338 p
Avail: Univ. Microfilms Order No. DA8302586

The vertical structure and surface characteristics of tropical maritime convective outflows over the Atlantic Ocean are investigated using instrumented tethered balloon and ship boom data collected during GATE. It is found that, while tropical maritime gust fronts are much less severe than those emanating from midlatitude continental storms, the updrafts induced at the gust fronts are sufficient to play a sigificant role in the initiation and maintenance of convection. A one dimensional hydrostatic and incompressible model based upon the shallow water wave equations is developed. Axial symmetry is used to simulate outflows in a nonshearing environment, and slab symmetry is used to simulate unidirectional outflow. The data from two GATE gust front cases and one midlatitude squall line are used as input into the model and the results compared with the observations. The unidirectional model is capable of simulating the slope, depth and overall shape of both a mature and a decaying squall line gust front. The mean flow rates behind the model gust front compare well with horizontal velocities measured in the lower 1000 m.
Dissert. Abstr.

N83-36587*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA/MSFC FY-83 ATMOSPHERIC RESEARCH REVIEW
Robert E. Turner, comp. and Dennis W. Camp, comp. Washington Oct. 1983 34 p refs Rev. held in Huntsville, Ala., 24-25 May 1983
(NASA-CP-2288; NAS 1.55:2288) Avail: NTIS HC A03/MF A01 CSCL 04B

Atmospheric research conducted at the Marshall Space Flight Center in FY 1983 is discussed. Clear air turbulence, gusts, and fog dispersal near airports is discussed. The use of Doppler Lidar signals in discussed, as are low level flow conditions that are hazardous to aircraft. For individual titles, see N83-36588 through N83-36595.

N83-36588*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
B-57B GUST GRADIENT PROGRAM
Warren Campbell and Dennis W. Camp *In its* NASA/MFSC FY-83 Atmospheric Res. Rev. Oct. 1983 p 3-4 refs (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

Analysis of data obtained from the Joint Airport Weather Studies Flights 6 and 7 is underway. Data from Flight 7 indicate that the B-57B encountered the upper portion of an outflow feature (microburst) at an altitude of 400 meters above ground level. Horizontal wind vector plots along the flight path have provided clues concerning the meteorological setting of the flights. In addition to suspected outflow features, wavelike variations of the horizontal wind vectors were observed. Statistical studies of gust gradients were undertaken with the goal of fitting probability density functions to the data. As expected, the density functions were highly non-Gaussian. Spectral analyses are proceeding and several spectral models for the gust gradient data are being investigated.
Author

N83-36589*# National Center for Atmospheric Research, Boulder, Colo. Field Observing Facility.
THE JOINT AIRPORT WEATHER STUDIES (JAWS) PROJECT
John McCarthy, James Wilson, and T. Theodore Fujita (Chicago Univ.) *In* NASA. Marshall Space Flight Center NASA/MSFC FY-83 Atmospheric Res. Rev. Oct. 1983 p 5-10 refs (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

A block diagram of the joint airport weather studies program is presented. Background leading to the development of the program is reviewed. Basic studies, aircraft performance, and detection and warning techniques used to develop fine scale structure of thunderstorm dynamics and kinematics in the vicinity of a major airport; effect of thunderstorm low level wind shear on aircraft performance; and development of real time testing of flow level wind shear detection and warning techniques and displays are described. Author

N83-36590*# Dayton Univ., Ohio. Research Inst.
DEVELOPMENT OF AN OPERATIONAL SPECIFIC CAT RISK (SCATR) INDEX
John L. Keller, Patrick A. Haines, and James K. Luers *In* NASA. Marshall Space Flight Center NASA/MSFC FY-83 Atmospheric Res. Rev. Oct. 1983 p 11-12 refs (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

The original formulations of Roach (1970) and Oard (1974) for the calculation of clear air turbulence (CAT) potential from

synoptic scale data were extended. An index which gives a measure of the specific risk of encountering CAT - the specific clear air turbulence risk (SCATR) index - was defined. This index takes into account both the locally and advected contributions to the energy necessary for CAT. The advected contribution is associated with the role of atmospheric gravity waves. The SCATR index was calculated for a number of cases where documented encounters with CAT occurred. Of particular interest were those made for cases involving severe CAT. The results for the two severe CAT cases run were quite impressive and elicited considerable interest from operational aviation meteorologists. R.J.F.

N83-36591*# FWG Associates, Inc., Tullahoma, Tenn.
WARM FOG DISPERSAL
Walter Frost *In* NASA. Marshall Space Flight Center NASA/MSFC FY-83 Atmospheric Res. Rev. Oct. 1983 p 14-15 refs (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

The charged particle generator was further tested after some design modification. The generator performance was measured with additional instrumentation and found to confirm previous measurements. Plans for a field testing were than developed. The overall status of the program and the field test plans were presented to a group of atmospheric scientists and electrostatic experts at the NASA/MSFC sponsored USRA Workshop on Electrostatic Fog Dispersal at NCAR, Boulder, Colorado discussed in previous sections. The recommendations from this workshop are being evaluated as to whether NASA should proceed with the field test or whether further theoretical research on the phenomenon of electrostatic fog dispersal and additional development of the charged particle generator should be carried out. Information obtained from the USRA Workshop clearly identified three physical mechanisms that could possibly influence the fog dispersal process, which heretofore have not been considered, and which may provide additional insight to the direction of further fog dispersal work. These mechanisms are: the effect of corona discharge on the electric field strength at the surface, the influx of fog into the cleared volume by turbulent diffusion, and the increase in supersaturation as liquid water is removed, activating haze particles, and thus generating more fog. Plans are being formulated to investigate these mechanisms. Author

N83-36592*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LOW-LEVEL GUST GRADIENT PROGRAM AND AVIATION WORKSHOP EFFORT
Walter Frost, Ming-Chang Lin, Linda W. Hersham, Dennis W. Camp, and Warren Campbell *In its* NASA/MFSC FY-83 Atmospheric Res. Rev. Oct. 1983 p 16-17 refs Prepared in cooperation with Tennessee Univ. Space Inst, Tullahoma (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

The Proceedings of the Workshop on Meteorological and Environmental Inputs to Aviation Systems, hosted by the University of Tennessee Space Institute, October 26-28, 1982, were prepared for publication. The Proceedings were submitted to FAA and will be distributed by August. Also, the proceedings of a one day workshop devoted specifically to wind shear and hosted during the same time frame were prepared and distributed. Plans for the 1983 workshop are proceeding extremely well. The workshop theme was established, the committee topics identified, and all ten committee chairmen contacted have agreed to accept their respective assignments. Additional logistics for the workshop are being carried out. The 1983 workshop is scheduled for October 26-28, 1983. Data gathered with the B-57B during the Joint Airport Weather Studies Project in Denver, Colorado, were analyzed. All runs for Flight 6 on July 16, 1982, were analyzed. Spectra, cross spectra and probability distributions were computed for each run. Also, Runs 10-14 of Flight 7 on July 15, 1982, were analyzed in similar detail. R.J.F.

N83-36593*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FEASIBILITY STUDY OF A PROCEDURE TO DETECT AND WARN OF LOW-LEVEL WIND SHEAR
Walter Frost (FWG Associates, Inc.) and Dennis W. Camp *In its* NASA/MFSC FY-83 Atmospheric Res. Rev. Oct. 1983 p 18-19 refs (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

The wind shear program is directed toward investigating the effects of wind shear on aerodynamic performance. Combining the Joint Airport Weather Studies wind shear data with the B-57B gust gradient data, the transient scales of motion involved in wind shear aircraft accidents or mishaps are being identified. The effect of variable winds having these time scales on the aerodynamic coefficients of moist airfoils were fully investigated. Transient and spatial variation of flow over the airfoil may cause premature stall or hysteresis effects which significantly impact the lift and drag (i.e., aerodynamic coefficients). Analysis of airfoil performance subject to 4-D variable flows will be carried out. R.J.F.

N83-36594*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DOPPLER LIDAR SIGNAL AND TURBULENCE STUDY
Walter Frost (FWG Assoc., Inc.), K. H. Huang (FWG Assoc., Inc.), and Dan F. Fitzjarrald *In its* NASA/MFSC FY-83 Atmospheric Res. Rev. Oct. 1983 p 20-21 (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

Comparison of the second moments of the Doppler lidar signal with aircraft and tower measured parameters is being carried out. Lidar binary data tapes were successfully converted to ASCII Code on the VAX 11/780. These data were used to develop the computer programs for analyzing data from the Marshall Space Flight Center field test. Raw lidar amplitude along the first 50 forward and backward beams of Run No. 2, respectively was plotted. Plotting techniques for the same beams except with the amplitude thresholded and range corrected were developed. Plotting routines for the corresponding lidar width of the first 50 forward and backward beams were also established. The relationship between raw lidar amplitude and lidar width was examined. The lidar width is roughly constant for lidar amplitudes less than 120 dB. A field test with the NASA/MSFC ground based Doppler lidar, the instrumented NASA B-57B gust gradient aircraft, and the NASA/MSFC eight tower array was carried out. The data tape for the lidar was received and read. The aircraft data and tower data are being digitized and converted to engineering units. Velocities computed sequentially along each of the lidar beams beginning at 16:40:00, May 12, 1983 were plotted for Run No. 1. R.J.F.

N83-36595*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LOW-LEVEL FLOW CONDITIONS HAZARDOUS TO AIRCRAFT
Margaret B. Alexander and Dennis W. Camp *In its* NASA/MFSC FY-83 Atmospheric Res. Rev. Oct. 1983 p 22-23 ref (For primary document see N83-36587 24-47)
Avail: NTIS HC A03/MF A01 CSCL 04B

Low level flow conditions known to be hazardous to aircraft during takeoff/climbout and approach/landing operations are turbulence, wind shear, and vertical motion. These conditions can and frequently do occur separately and in combinations. The identification and selection were completed of representative data cases to determine magnitude, frequency, duration, and simultaneity of occurrence of turbulence (gustiness and gust factor), wind shear (speed and direction), and vertical motion (updraft and downdraft), along with temperature inversions. New representations of temporal and spatial variations in the atmospheric boundary layer were developed. Efforts continued relative to low level flow conditions where published results imply strong vertical shear with virtually no horizontal shear and where order of magnitude analyses of the equations of motion for an aircraft illustrates that low values of horizontal shear (along the flight path) are much more hazardous than larger values of vertical wind shear (altitude). R.J.F.

N83-36596*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THE NASA THUNDERSTORM OVERFLIGHT PROGRAM (TOP): RESEARCH IN ATMOSPHERIC ELECTRICITY FROM AN INSTRUMENTED U-2 AIRCRAFT PLATFORM
Otis H. Vaughan, Jr. Aug. 1983 49 p refs
(NASA-TM-82545; NAS 1.15:82545) Avail: NTIS HC A03/MF A01 CSCL 04B

An overview of the NASA Thunderstorm Overflight Program (TOP) is presented. The various instruments flown on the NASA U-2 aircraft, as well as the ground instrumentation used to collect optical and electronic signature from the lightning events, are discussed. Samples of some of the photographic and electronic signatures are presented. Approximately 6400 electronic data samples of optical pulses were collected and are being analyzed. Author

N83-36597# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
SOME APPLICATIONS OF SATELLITE RADIATION OBSERVATIONS TO CLIMATE STUDIES
T. S. Chen, George Ohring, and Haim Ganot (Tel Aviv Univ.) Sep. 1983 25 p refs
(NOAA-TR-NESDIS-4) Avail: NTIS HC A02/MF A01

The sensitivities of the longwave radiation emitted by the Earth-atmosphere system to variations in surface temperature and cloud amount are evaluated from observations. The technique used is linear regression applied to zonal average data sets of longwave radiation, cloud amounts, and surface temperature. The dependence of these sensitivity coefficients on different radiation and cloud data sets and on the time averaging period is examined. The results show a strong dependence of the sensitivity coefficient to the specific radiation or cloud amount data set used in the analysis and also on whether one uses annual or monthly means. To a much smaller extent this is also true of the temperature sensitivity coefficient. Based on simulations, a simple linear relationship is derived between the planetary albedo and the surface albedo for the case of clear skies. This relationship is checked by applying it to zonally averaged surface albedos in order to predict the clear sky planetary albedos, which are then compared to satellite determinations of zonally averaged minimum albedos. Author

N83-36598*# Dayton Univ., Ohio.
A MODEL FOR NOCTURNAL FROST FORMATION ON A WING SECTION: AIRCRAFT TAKEOFF PERFORMANCE PENALTIES Final Report
Mark A. Dietenberger Washington NASA Oct. 1983 95 p refs (Contract NAS8-33369)
(NASA-CR-3733; NAS 1.26:3733) Avail: NTIS HC A05/MF A01 CSCL 04B

The nocturnal frost formation on a wing section, to explain the hazard associated with frost during takeoff was investigated. A model of nocturnal frost formation on a wing section which predicts when the nocturnal frost will form and also its thickness and density as a function of time was developed. The aerodynamic penalities as related to the nocturnal frost formation properties were analyzed to determine how much the takeoff performance would be degraded by a specific frost layer. With an aircraft takeoff assuming equations representing a steady climbing flight, it is determined that a reduction in the maximum gross weight or a partial frost clearance and a reduction in the takeoff angle of attack is needed to neutralize drag and life penalities which are due to frost. Atmospheric conditions which produce the most hazardous frost buildup are determined. E.A.K.

N83-36599# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). HUNTER AAF, GEORGIA. PARTS A-F Final Report
Jan. 1983 400 p
(AD-A128116; AD-E850366; USAFETAC/DS-83/002) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Hunter AAF, Georgia. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperature and relative humidity); and (F) pressure Summary (means, standard, deviations, and observation counts of station pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N83-36600# New Mexico State Univ., Las Cruces. Lab. for Physical Sciences.
MODELS FOR BALLISTIC WIND MEASUREMENT ERROR ANALYSIS. VOLUME 2: USERS MANUAL Final Report
Arthur W. Dudenhoeffer White Sands Missile Range, N. Mex. Army Atmospheric Sciences Lab. Jan. 1983 118 p refs (Contract DAAD07-79-C-0008)
(AD-A126360; ERADCOM/ASL-CR-83-0008-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

Three models for ballistic wind measurement error analysis are discussed. These models, are named RAWIN, RADAR, and NAVAID. Each is applicable to a different type of meteorological acquisition system. RAWIN models the case of a balloon-borne radiosonde and ground based set for radiodirection finding and telemetry data reception. RADAR models the case in which a ground based radar set tracks an ascending balloon. NAVAID models the case in which radionavigation techniques are used to determine radiosonde position. Expressions for the variance in the East and North components of ballistic wind are obtained in terms of bias and random measurement errors and other parameters. Also, an average error quantity called the component velocity variance is defined. Each model is described and the necessary computational expressions are derived. GRA

N83-36601# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
AUTOMATIC DETECTION OF HAIL BY RADAR Final Report
Pio J. Petrocchi 29 Sep. 1982 32 p refs
(AF Proj. 6670)
(AD-A130078; AFGL-TR-82-0277; AFGL-ERP-796) Avail: NTIS HC A03/MF A01 CSCL 04/2

An automated model algorithm for identifying hailstorms by radar is described. Hailstorms are identified by totaling seven weighted indicators based on a three-dimensional reflectivity structure of an ideal hailstorm. The weighting functions for each indicator and the total identifying the storms were determined by testing the algorithm with radar data that were verified by ground truth data. By use of these findings, the probability of detecting hail is 94 percent with a false alarm ratio of 6 percent for a critical success index (CSI) = 0.886 for this test sample. Author (GRA)

N83-36602# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
A MODEL FOR THE ESTIMATION OF RAIN DISTRIBUTIONS Interim Report
R. O. Berthel and V. G. Plank 1 Feb. 1983 50 p refs
(AF Proj. 6670)
(AD-A130080; AFGL-TR-83-0030; AFGL-ERP-822) Avail: NTIS HC A03/MF A01 CSCL 04/2

The adverse attenuation effects caused by rain or snow on electro-optical weapons and communication systems are important considerations in any military operation. Attenuation is a function of the E-O wavelength and the number, size, and type of precipitation or cloud particles. The amount (liquid-water-content) and type of precipitation in any given area may be predicted by meteorological modeling techniques or inferred through remote sensing, yet neither method currently has the ability to define the distribution parameters (numbers and sizes) of the precipitating

particles. This report describes the development of a model that may be used to estimate the parameters of precipitable rain distributions from inputs of liquid-water-content and/or measurements of radar reflectivity coupled with standardized cloud physics relationships. The model is developed from an equation set based on an exponential distribution function. Aircraft-acquired data are used to verify the conformity of rain distributions to exponential shapes. Empirical relationships provided by these data verified the existence of a nondimensional predictable entity (Lambda D sub M = distribution slope times maximum drop size), which provides improved estimates of rain distributions from predicted or measured values of liquid-water-content and radar reflectivity. Tables listing the variations in the size distributions during three rain situations are given in Appendix A. Author (GRA)

N83-36603# Naval Postgraduate School, Monterey, Calif.
OPEN-OCEAN FOG FORECASTING: USE OF LEIPPER AND CLARK FOG INDICES AT OCEAN STATION VICTOR (34N, 134E), JULY AUGUST 1968, 1970 AND 1971 Technical Report, Jul. - Sep. 1982
Glenn H. Jung 30 Jun. 1983 80 p refs
(AD-A130517; NPS63-83-003) Avail: NTIS HC A05/MF A01 CSCL 04/2

Fog-forecasting parameters used by Leipper along the California coastline were adapted for open-ocean use by Clark (1981) in the Gulf of Alaska for non-frontal fog situations. Clark's fog-forecasting indices are tested now for another North Pacific Ocean location at OSV V (34N, 164E) during July-August, 1968-1971. These indices appear to describe frontal as well as non-frontal fog situations in the North Pacific Ocean in the summer. Additional study is needed to forecast precise start and termination times of such fog occurrence. Author (GRA)

N83-36604# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
AN APPRAISAL OF THE SHORT-RANGE FORECAST PROBLEM USING POWER SPECTRA Scientific Interim Report
H. Stuart Muench 19 Nov. 1982 42 p refs
(AF Proj. 6670)
(AD-A129315; AFGL-TR-82-0353; AFGL-ERP-806) Avail: NTIS HC A03/MF A01 CSCL 04/2

Skill-scores, relative to climatology, for some parameters such as ceiling/visibility and precipitation are much lower than others, such as minimum temperature and pressure gradients. Also, the skill-scores have been improving appreciably faster for forecasts of 36 h (and more) than for forecasts of 24 h (and less). At the shortest ranges, less than 12 h, skill-scores relative to persistence are rather low, with values of 0.0 to 0.5 as typical. Power spectra for wind, temperature, dew point, rainfall rate, cloud reflectivity, and extinction coefficient (inversely related to visibility) were computed for periods of 10 min to 20 days, using fall season data from northeast United States. Analyses of these spectra indicate some of the problems in forecasting. Wind, temperature, and dew point spectra all had considerably more power at periods longer than 24 h than did rainfall rate, cloud reflectivity, and extinction coefficient, which relates to differences in forecast skill-scores. The greatest contribution to change for 2- to 8-h forecasts comes from disturbances with periods of about 8 to 32 h. Disturbances with periods shorter than about 24 h are purposedly filtered from current operational numerical models, in order to improve performance over longer ranges. The disturbances filtered out may be relatively unimportant to wind and temperature forecasts but quiet important for cloud and precipitation forecasts. Disturbances with periods less than about 2 h cannot be adequately resolved temporally or spatially using current weather data, yet these disturbances have sufficient amplitude to contribute noise in the analyses of longer period disturbances. GRA

N83-36605# Weather Squadron (31st), APO New York, N.Y. Detachment 19.
TERMINAL FORECAST REFERENCE NOTEBOOK FOR INCIRLIK AB, TURKEY Final Report
8 Jun. 1983 70 p
(AD-A129982) Avail: NTIS HC A04/MF A01 CSCL 04/2

Incirlik, Turkey location and terrain summary; airfield layout, weather equipment and local weather; the climate of Turkey; meteorological techniques; weather controls; and synoptic patterns are discussed. N.W.

N83-36606# Army Missile Command, Redstone Arsenal, Ala. Research Directorate.
URBAN INFLUENCES ON FOG
Dorathy A. Stewart Dec. 1982 33 p refs
(AD-A130016; AD-E950409; DRSMI/RR-83-1-TR) Avail: NTIS HC A03/MF A01 CSCL 04/2

This report summarizes the first year of work on the in-house laboratory independent research project Factors Affecting Atmospheric Secular Trends in Wartime. The first step was to make a through literature survey of what is presently known about anthropogenic influences on atmospheric trends. This survey revealed that there is no general agreement concerning some basic questions, i.e., in which season the urban heat island is strongest. Water vapor in fog was investigated. Large year-to-year fluctuations in meteorological conditions at three German stations masked any trend in mean dew point in fog which otherwise might have occurred during a period in which the number of automobiles increased more than 20 times. This effect was partially eliminated by comparing hours when the atmosphere is very stable with less stable hours during which anthropogenically produced water vapor is likely to be diluted by mixture through a deep layer. Berlin and Frankfurt showed a trend in winter in which dew points during stable hours increased relative to those during less stable times. Dew points during fog in winter and spring at Frankfurt also increased with time relative to dew points during fog at two nearby small towns. Author (GRA)

N83-36607# Pennsylvania State Univ., University Park. Dept. of Meteorology.
ANALYSIS AND PREDICTION OF SEVERE STORM ENVIRONMENT Final Report
Toby N. Carlson, Thomas T. Warner, and Michael J. Fritsch Feb. 1983 17 p refs
(Grant AF-AFOSR-0125-79; AF Proj. 2310)
(AD-A129247; AFOSR-83-0440TR) Avail: NTIS HC A02/MF A01 CSCL 04/2

The most significant aspect of this research regards the role of differential surface heating and topography in the development of mesoscale weather. Research has progressed in four areas: conceptual development, model development, model sensitivity tests, and prediction. The effect of surface heating and topography on precipitation and lid generation are forming the basis of current and on-going numerical and conceptual research. The effect of variations in soil moisture on the mesoscale environment has been identified as a most significant factor. The strength of the capping lid has been related to the likelihood and intensity of convective precipitation, especially involving the dynamics of lid edge zone. A great deal of effort was devoted to parameterization of surface heating, cloudiness, and convective precipitation. During this research effort great strides were made in the conceptual awareness of the complexity of the relationships between synoptic forcing and mesoscale development. Enormous improvements were made in parameterizing the surface boundary layer. What began as an examination of the lid mechanism with regard to severe convection broadened to explain the complex interaction of a variety of differing influences on the severe storm environment and on precipitation. Author (GRA)

N83-36608# Alaska Univ., Fairbanks. Geophysical Inst.
INVESTIGATION OF SHEAR-INDUCED TURBULENCE BY MST (MESOSPHERE-STRATOSPHERE-TROPOSPHERE RADAR) Final Report, 1 Oct. 1980 - 30 Sep. 1982
Gerald J. Romick, Kolf Jayaweea, and Steven A. Smith 30 Sep. 1982 32 p refs
(Grant AF-AFOSR-0286-80; AF Proj. 2310)
(AD-A129203; AFOSR-83-0437TR) Avail: NTIS HC A03/MF A01 CSCL 04/2

Wind speed and C sub N squared measurements made with the Poker Flat, Alaska MST radar are used to study the development of clear air turbulence (CAT) near the tropopause. Arguments and observations that indicate C sub N squared is proportional to the intensity of turbulence are presented. The relationship between wind shear and turbulence is examined using time-lagged cross correlations of measured shears and C sub N squared time series. From analysis of data taken with spatial resolutions of 2200 m and 750 m, it is found that the correlation improves as the time and spatial resolutions of the measurements improve. The implications for forecasting CAT are discussed, based on the correlation results and a comparison of radar data with National Weather Service CAT forecasts. Author (GRA)

N83-36609# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.

USAF (UNITED STATES AIR FORCE) ACADEMY WIND SITE SURVEY: METHODOLOGIES FOR USE BY THE AIR FORCE Final Report, May 1977 - Dec. 1980

Thomas E. Kullgren, Thomas C. Finley, and Steven C. Boyce Mar. 1983 171 p refs
(AF Proj. 2103)
(AD-A129581; AFESC/ESL-TR-81-02) Avail: NTIS HC A08/MF A01 CSCL 04/2

This report describes a wind site survey to locate potential high energy sites at the USAF Academy for future wind machine installation. Surveying techniques developed during the project are described and illustrated. Site-specific results, including wind characteristics and economic analyses, are presented. Three wind site surveying methodologies are presented. Author (GRA)

N83-36610# State Coll. of Central Connecticut, New Britain.

AN INVESTIGATION INTO THE NATURE OF SNOWFLAKE AGGREGATION IN THE VICINITY OF THE MELTING LAYER IN STRATIFORM CLOUDS Final Report

Steven B. Newman 1 Mar. 1983 31 p refs
(Grant AF-AFOSR-0173-82; AF Proj. 2310)
(AD-A129343; AFOSR-83-0438TR) Avail: NTIS HC A03/MF A01 CSCL 04/2

Data from AFGL research flights were analyzed to determine the size spectra of snowflakes vs. temperature at levels just above the melting layer in stratiform clouds. Percentages of particles in various size ranges reveal a pattern of apparent snowflake aggregation and breakup which compare well with the mechanism proposed by Lo and Passarelli (1982). In addition, a model of snowflake aggregation and breakup has been developed and run for various cloud parameters such as collection efficiency and cloud ice contents. The results of this analysis predict snowflake breakup temperatures quite close to those observed from the AFGL data. Author (GRA)

N83-36611# Naval Ocean Systems Center, San Diego, Calif. Ocean and Atmospheric Sciences Div.

AEROSOL SPECTRA OBSERVED IN MARINE STRATUS CLOUDS. ANALYSIS OF AIRBORNE MULTILEVEL MEASUREMENTS TAKEN 130 km SW OF SAN DIEGO Technical Progress Report, Aug. 1981 - Apr. 1983

V. R. Noonkester 13 Apr. 1983 36 p refs
(AD-A129436; NOSC/TD-586) Avail: NTIS HC A03/MF A01 CSCL 04/2

Airborne measurements of the aerosol size spectra, n(r), for radii between 0.23 and 150 micrometers were made at about 14 levels in stratus layers 130 km SW of San Diego during May and August 1981. Both marine and continental air masses were represented. Four parameters were derived from 15 n(r)s observed along each level for a distance of 6.44 km and from the average n(r) over the entire run. Profiles of the four parameters were constructed as a function of the distance from the cloud base. Profiles on the marine and continental days differed: the continental day contained many more small aerosols. GRA

N83-36612# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.

NOGAPS (NUMERICAL OPERATIONAL GLOBAL ATMOSPHERIC PREDICTION SYSTEM) VERIFICATION USING SPECTRAL COMPONENTS M.S. Thesis

Peter A. Morse Mar. 1983 72 p refs
(AD-A129435) Avail: NTIS HC A04/MF A01 CSCL 04/2

In this study, one three-day and two five-day Numerical Operational Global Atmospheric Prediction System (NOGAPS), 500mb forecasts were spectrally verified. The wavenumber components of the observed and forecasts waves were grouped into planetary (wavenumbers 1-3), long (wavenumbers 5-7) and medium (wavenumbers 8-12) wavenumbers for verification. The observed and forecast trough-ridge (hovmoller) diagrams of longitude versus time for each group were analyzed for each case. In all three cases, the most serious errors occurred in the planetary waves where the model often forecast erroneously large or small amplitudes. The long waves were the most accurately forecast group both in amplitude and phase speed. The medium wave amplitudes were forecast too weak and phase speeds were consistantly too fast for this group. Author (GRA)

N83-36613# Massachusetts Univ., Amherst. School of Engineering.

EMPIRICAL MODELING OF WIND-SPEED PROFILES IN COMPLEX TERRAIN

R. H. Kirchhoff and F. C. Kaminsky Apr. 1983 109 p refs
(Contracts DE-AC06-82RL-10374; DE-AC06-76RL-01830)
(DE83-011613; DOE/ET-10374/82/1) Avail: NTIS HC A06/MF A01

This report begins in Section 2 with a description of field experiments that were conducted in order to determine the random nature of the wind shear coefficient, (-), and its relation to synoptic weather categories. A description of the stochastic behavior of the synoptic weather categories over time is then provided in Section 3 using the theory of Markov chains and two years of data on synoptic weather categories. The persistence of each synoptic weather category and the manner in which transitions are made between categories are highlighted. Annual and seasonal behavior is examined in detail. In Section 4, time series models are developed for average wind speed in 15 minute intervals for the different synoptic weather categories. The approach suggested by Box and Jenkins is used in this analysis. Finally, in Section 5, techniques for estimating the power available to a wind turbine, given a known wind shear profile, are examined. Although the results are preliminary, and a considerable amount of work needs to be done, the approach does appear to give structure to the ultimate objective of providing better estimates of energy production from a WECS. DOE

N83-36614# California Univ., Livermore. Lawrence Livermore Lab.

ISOLATING THE CLIMATOGENIC EFFECTS OF VOLCANOES

Hugh W. Ellsaesser 1983 31 p refs Meeting of Experts on Anthropogenic Climatic Change, Leningrad, 4-10 Jul. 1983
(Contract W-7405-eng-48)
(DE83-014948; UCRL-89161; CONF-830766-1) Avail: NTIS HC A03/MF A01

Attempts to isolate and quantify the climatogenic effect of volcanic eruptions were on at least two independent estimates of atmospheric transparency, four independent chronologies of volcanic eruptions and eight estimates of the relative magnitudes of their climatogenic potential (dust veil index, optical depth, etc.). A similar quantity of curves was used as representing the evolution of the hemispheric or global mean temperature. While essentially all of such studies noted an apparent coherence in time between major volcanic eruptions and falling surface temperatures, each found anomalies in the data which appear to contradict the assumed direct quantitative relationship between stratospheric dust loading and surface cooling. Among these were cooling in the absence of volcanoes or following non-explosive eruptions, onset of cooling before the eruption or before arrival of the volcanic dust cloud, greater cooling in the hemisphere receiving the least amount of volcanic dust, and comparable degrees of cooling for

stratospheric dust injections estimated to differ by up to two orders of magnitude. DOE

N83-36615# National Oceanic and Atmospheric Administration, Miami, Fla. Research Facilities Center.
DESCRIPTION AND OPERATING PROCEDURES FOR THE NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) C-130 AWRD (AIRBORNE WEATHER RECONNAISSANCE SYSTEM) SYSTEM
Kenneth J. Haydu and Evan R. Darby Mar. 1983 61 p
(PB83-197053; NOAA-TM-ERL-RFC-11; NOAA-83042204) Avail: NTIS HC A04/MF A01 CSCL 04B

The AWRS locataed on board the C-130 is described. The AWRS was built to provide a better RECCO (Reconnaissance Code) system. The AWRS is a computer system which collects, assembles and displays flight and meteorological parameters to assist in the preparation of RECCOs. Chapter illustrations of the SWRS at the flight director's station and all of the control panels that the user should be familar with in order to run the system are included. The minimum operational procedures that need to be performed. A detailed list of operational procedures which should be performed when time permits. Instruction for loading tapes and also deals with problems that may occur during this process. The Aircraft Satellite Data Link. GRA

N83-36616# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
TWO STANDARD PRECIPITATION GAGES AND THE GAMMA TRANSMISSION SNOW GAGE: A STATISTICAL COMPARISON Final Report
James A. Bergman Dec. 1982 9 p
(PB83-219014; FSRN-PSW-358) Avail: NTIS HC A02/MF A01 CSCL 04B

Data from two types of recording precipitation gages and a gamma transmission profiling snow gage installed near Soda Springs, in the Sierra Nevada of California, were statistically compared. Precipitation catches by a weighing bucket and a tipping bucket gage were closely correlated ($r = 0.9832$), but weighing bucket gage catch and snow gage measurement were less closely correlated ($r = 0.9246$). Equations have been developed for predicting weighing bucket gage catch from tipping bucket catch. Also presented are equations for predicting weighing bucket catch from changes in snowpack water equivalent that have occurred from one snow gage measurement to the next. GRA

N83-36617# National Weather Service, Garden City, N.Y.
STABILITY AND OTHER PARAMETERS FROM THE FIRST TRANSMISSION RAOB DATA
Charles D. Little May 1983 30 p
(PB83-220475; NOAA-NWS-ERCP-11; NOAA-83061703) Avail: NTIS HC A03/MF A01 CSCL 04B

This software package consists of 2 main programs--UA and STAB. The programs decode mandatory level data, analyze it and store the final product into the AFOS data base. The final product, in table form, contains several stability parameters, a first guess of precipitable water and tropopause height, an estimate of maximum temperature and several other parameters. The programs were written to aid the forecaster in rapid assessment of current raob data, especially in convective and flash flood situations. Author (GRA)

N83-36618# National Hurricane Research Lab., Coral Gables, Fla.
NATIONAL HURRICANE RESEARCH LABORATORY FISCAL YEAR 1982 PROGRAMS, FISCAL YEAR 1983 PROJECTIONS
Jan. 1983 60 p refs
(PB83-207753; NOAA-83051903) Avail: NTIS HC A04/MF A01 CSCL 04B

The National Hurricane Research Laboratory (NHRL), an element of the Atlantic Oceanographic and Meteorological Laboratories (AOML), is NOAA's primary focus for research on hurricanes and tropical meteorology. NHRL's research is directed at improving hurricane prediction and increasing our knowledge of the storms' structure, dynamics, and multiscale interactive processes. The laboratory's hurricane field program uses the highly instrumented Research Facilities Center (RFC) aircraft to acquire data sets that are analyzed to describe and understand the dynamics and energetics of hurricane. The primary goal of NHRL's 1982 Hurricane Field Program was to gather observations of the environmental flow around mature hurricanes in the western Atlantic, Caribbean, and Gulf of Mexico. Author (GRA)

N83-36619# Colorado Dept. of Natural Resources, Denver. Weather Modification Program.
COMPARISON OF THE POTENTIAL OF CLOUD SEEDING TO ENHANCE MOUNTAIN SNOWPACK IN COLORADO DURING DRY, NORMAL AND WET WINTERS
Lynn A. Sherretz, Robert M. Rauber, and Loren D. Nelson Jan. 1983 60 p refs Sponsored in part by Bureau of Reclamation
(PB83-205682) Avail: NTIS HC A04/MF A01 CSCL 04B

This study compares the potential of cloud seeding to enhance mountain snowpack in Colorado during dry, normal and wet winters. Seedable storms are identified from 13 winters of interpolated rawinsonde observations. While a few more seedable storms are identified in the wet than in the dry winters, this difference is not significant statistically; neither is the difference in percentage increases in the moisture content of snow expected from seeding all eligible storms. Part use of seeding in Colorado for drought relief is discussed. Author (GRA)

N83-36537# Joint Publications Research Service, Arlington, Va.
COSMIC HORIZONS IN CLIMATOLOGY
Kirill Yakovlevich Kondratyev *In its* USSR Rept.: Earth Sci., No. 29 (JPRS-84526) 13 Oct. 1983 p 1-15 refs Transl. into ENGLISH from Priroda (Moscow), no. 4, Apr. 1983 p 23-33 Previously announced as A83-31315 (For primary document see N83-36536 24-42)
Avail: NTIS HC A04

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N83-36620# Phoenix Corp., McLean, Va.
A STUDY OF DEEP SEA TIDE DETERMINATION BY SEASAT ALTIMETER DATA Final Report, 1 Apr. 1982 - 31 Mar. 1983
Richard D. Brown 31 May 1983 25 p refs
(Contract N00014-82-C-0368)
(AD-A129869) Avail: NTIS HC A02/MF A01 CSCL 08/3

The objective of this study was to extend the SEASAT altimeter determination of the M2 ocean tide from a single point near Cobb seamount in the northeast Pacific ocean to all the world's oceans on a 5-deg grid. After extending the grid to 32 locations covering the northeast Pacific ocean, it became apparent that the resulting tidal charts contained unrealistic features. In addition, large discrepancies existed between the altimeter determined parameters and those determined from bottom pressure gauges. Further extension of the altimeter solutions was therefore stopped and the study efforts were redirected to study the reason for the discrepancies. It was concluded that the uncertainty of the altimeter solutions was much higher than originally anticipated, due to the near-resonance of the SEASAT orbit with the dominant tidal components and the relative shortness of the SEASAT mission. The extension of the altimeter tide solution for M2 over the world's oceans requires data from a future altimeter satellite mission spanning at least one year. Author (GRA)

N83-36621# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
ATLANTIC COAST HINDCAST, SHALLOW-WATER, SIGNIFICANT WAVE INFORMATION Final Report
Robert E. Jensen Jan. 1983 713 p refs
(AD-A129642; WIS-9) Avail: NTIS HC A99/MF A01 CSCL 12/1

Using a numerical transformation technique, significant wave

data (height, peak period, and direction) have been computed for the 20-year interval 1956 through 1975 for the U.S. Atlantic coast. The wave data are presented for 166 stations in six data products: (1) Geographical variation in the wave climate; (2) Twenty-year percent occurrence tables; (3) Wave rose diagrams; (4) Mean and largest wave-height tables; (5) Return period tables, including wave parameter statistics; and (6) Over duration tables. A brief description of each product is given and some sections on use of the products, including examples, are provided. GRA

N83-36622# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
THE NUMERICAL SYNTHESIS AND INVERSION OF ACOUSTIC FIELDS USING THE HANKEL TRANSFORM WITH APPLICATION TO THE ESTIMATION OF THE PLANE WAVE REFLECTION COEFFICIENT OF THE OCEAN BOTTOM Ph.D. Thesis
Douglas R. Mook Jan. 1983 229 p refs Prepared in cooperation with Woods Hole Oceanographic Institution
(Contract N00014-81-K-0742; Grant NSF ECS-80-7102; NR Proj. 049-506)
(AD-A129461; TR-497) Avail: NTIS HC A11/MF A01 CSCL 20/1

The plane wave reflection coefficient is an important geometry independent means of specifying the acoustic response of a horizontally stratified ocean bottom. It is an integral step in the inversion of acoustic field measurements to obtain parameters of the bottom and it is used to characterize an environment for purposes of acoustic imaging. This thesis studies both the generation of synthetic pressure fields through the plane wave reflection coefficient and the inversion of measured pressure fields to estimate the plane wave reflection coefficient. These are related through the Sommerfeld integral which is in the form of a Hankel transform. The Hankel transform is extensively studied in this thesis and both theoretical properties and numerical implementations are considered. These results have broad applications. When we apply them to the generation of synthetic data, we obtain hybrid numerical-analytical algorithms which provide extremely accurate synthetic fields without sacrifising computational speed. These algorithms can accurately incorporate the effects of trapped modes guided by slow speed layers in the bottom. We also apply these tools to study the inversion of measured pressure field data for the plane wave reflection coefficient. We address practical issues associated with the inversion procedure including removal of the source field, sampling, field measurements over a finite range, and uncontrolled variations in source-height. A phase unwrapping and associated interpolation scheme is developed to handle improperly spaced data. A preliminary inversion of real pressure field data is performed. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N83-36623# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 41
12 Sep. 1983 93 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84296) Avail: NTIS HC A05

This serial report contains news items, abstracts and articles of scientific reports on aspects of biomedical and behavioral sciences including aerospace medicine, biophysics, food technology, genetics, laser effects, marine mammals, microbiology, and veternary medicine. For individual titles, see N83-36624 through N83-36624.

N83-36624# Joint Publications Research Service, Arlington, Va.
ADVICE ON PROLONGING FLYING CAREERS c52
N. Rudnyy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 41 (JPRS-84296) 12 Sep. 1983 p 1-5 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 5, 1983 p 40-41 (For primary document see N83-36623 24-51)
Avail: NTIS HC A05

The long term effects of physical exercise on combat training and flight training were discussed. The use of alcohol and smoking and their effects on the psychophysiological reliability of pilots was also examined. B.G.

N83-36625# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 44
11 Oct. 1983 84 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84505) Avail: NTIS HC A05

This serial report contains news items, abstracts, and articles of scientific repots on aspects of biomedical and behavioral sciences including aerospace medine, agrotechnology, biochemistry, biophysics, epidemiology, microbiology, genetics, public health, toxicology and immunology. For individual titles, see N83-36626 through N83-36629.

N83-36626# Joint Publications Research Service, Arlington, Va.
AN EXPERT'S OPINION ABOUT FUTURE SPACEFLIGHTS c52
O. G. Gazenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 1-2 Transl. into ENGLISH from Sov. Rossiya (Moscow), 8 Apr. 1983 p 4 (For primary document see N83-36625 24-51)
Avail: NTIS HC A05

The influence of spaceflight conditions on man, animals and plants was studied. In the event of their adverse effects a search was made for means of controlling them, for example, the body's reactions to weightlessness. In general, the impression is gained that man can adapt satisfactorily to long term exposure to space. Positive results with respect to providing favorable living conditions aboard a spacecraft for man and animals was achieved. Space medicine doesn't have extraterrestrial applications. The numerous methods and instruments, which were developed to train cosmonauts and used in orbit are now well-used on Earth. Space experiments also have a substantial influence on development of theories about the origin and evolution of life on Earth. Author

N83-36627# Joint Publications Research Service, Arlington, Va.
CONVERSATION WITH PARTICIPANT IN PREPARATIONS FOR EXTRATERRESTRIAL LAUNCHES c12
Aleksandr Nemov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 4-9 Transl. into ENGLISH from Sov. Rossiya (Moscow), 8 Apr. 1983 p 4 (For primary document see N83-36625 24-51)
Avail: NTIS HC A05

Various aspects of weightlessness were discussed including dehydration, sensory deprivation, crew compatibility, life support systems, bone demineralization, erythrocyte life span, and psychological effects. B.G.

N83-36628# Joint Publications Research Service, Arlington, Va.
SPACEFLIGHT-RELATED QUESTIONS AND ANSWERS c12
V. Pishchik, comp. *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 10-12 Transl. into ENGLISH from Sov. Rossiya (Moscow), 8 Apr. 1983 p 4 (For primary document see N83-36625 24-52)
Avail: NTIS HC A05

The effects of long duration space flights, technology transfer, and diet were discussed. B.G.

N83-36629# Joint Publications Research Service, Arlington, Va.
EQUALIZATION OF URBAN AND RURAL MEDICAL SERVICES DISCUSSED c52
P. Petrov and G. Popov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 59-65 refs Transl. into ENGLISH from Nar. Khoz. Kazakhstana (Alma Ata), no. 5, May 1983 (For primary document see N83-36625 24-51)
Avail: NTIS HC A05

The system of medical aid to the rural population in the USSR

is based on the principle of stages (stage I -- rural medical clinics, uchastok hospitals, feldscher-midwife centers; stage II -- rayon establishments; stage III -- city, oblast and republic establishment). At each subsequent stage, patients receive more skillful and specialized medical assistance than at the preceding one. With espect to content, significance and volume, outpatient polyclinic service occupies an exceptionally important place. It is a mass form of the organization of medical services. One of the leading organizational principles is the uchastok principle. The needs of public health services are satisfied best, achievement of integrated solutions of medical, ecological, sociohygienic problems of disease and traumatism prevention, sanitation of the environment, improvement of working, living and relaxation conditions are made possible, and a conscientious attitude in the Soviet people is developed toward their health. Author

N83-36630*# George Washington Univ., Washington, D.C. Science Communication Studies.
BIOMEDICAL RESEARCH PUBLICATIONS, 1982 - 1983 Final Report
Christopher Bolcik and Linda G. Pleasant Washington NASA Oct. 1983 51 p
(Contract NASw-3165)
(NASA-CR-3739; NAS 1.26:3739) Avail: NTIS HC A04/MF A01 CSCL 06B

Cardiovascular deconditioning, motion sickness, bone alterations, muscle atrophy, blood cell alterations, fluid and electrolyte changes, radiation effects and protection, behavior and performance, and general biomedical research are covered in a bibliography of 444 items. N.W.

N83-36631# Desmatics, Inc., State College, Pa.
STATISTICAL IMPACT ACCELERATION INJURY PREDICTION MODELS BASED ON -Gx ACCELERATION DATA AND INITIAL HEAD CONDITIONS
Kevin C. Burns and Dennis E. Smith May 1983 21 p refs
(Contract N00014-79-C-0128)
(AD-A129353; TR-112-13) Avail: NTIS HC A02/MF A01 CSCL 12/1

Statistical impact acceleration injury prediction models are developed using data from 23 high-level -G sub X acceleration runs. These runs involve Rhesus monkeys with securely restrained torsos and unrestrained heads. The models are based on peak sled acceleration and initial head conditions. The model predictions are compared with those given in an earlier report based on different data and an estimate of Fisher's information matrix is used to evaluate the relative worth of the two data bases. Author (GRA)

N83-36632# Army Aeromedical Research Lab., Fort Rucker, Ala.
DEVELOPMENT OF THE SWINE AS A LARGE ANIMAL FOR NOISE RESEARCH
Michael Ettinger, Dennis L. Curd, and James H. Patterson, Jr. May 1983 29 p refs
(DA Proj. 3M1-61102-BS-10)
(AD-A129694; USAARL-83-9) Avail: NTIS HC A03/MF A01 CSCL 14/2

This report describes an attempt to develop the swine as a large animal model to be used in research on noise induced hearing loss. Animals were trained to perform in a yes-no signal detection paradigm for heat as a positive reinforcement. Results indicate that the animals can learn this task; however, the method failed to produce an audiogram. This was attributed to a failure to induce an adequate motivational level in the subjects. GRA

N83-36633# California Univ., San Diego. Inst. of Marine Resources.
ALGAE FROM THE ARID SOUTHWESTERN UNITED STATES: AN ANNOTATED BIBLIOGRAPHY
W. H. Thomas and S. R. Gaines Jun. 1983 144 p
(Contract DE-AC02-77CH-00178)
(DE83-011976; SERI/STR-231-1947) Avail: NTIS HC A07/MF A01

Desert algae are attractive biomass producers for capturing solar energy through photosynthesis of organic matter. They are probably capable of higher yields and efficiences of light utilization than higher plants, and are already adapted to extremes of sunlight intensity, salinity and temperature such as are found in the desert. An annotated bibliography of the literature on algae from the arid southwestern United States is presented. Isolation of desert algae and their yields in the laboratory are studied which is necessary prior to setting up outdoor algal culture ponds. Desert areas are attractive for such applications because land, sunlight, and, to some extent, water resources are abundant there. DOE

N83-36634# Argonne National Lab., Ill.
DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH ANNUAL TECHNICAL REPORT, 1982
M. W. Rosenthal, ed. May 1983 160 p
(Contract W-31-109-eng-38)
(DE83-015756; ANL-83-40) Avail: NTIS HC A08/MF A01

Studies in Carcinogenesis address mechanisms of chemical and radiation carcinogenesis including the processes of tumor initiation and promotion were reported. The rat liver and mouse skin models and human rodent cell culture systems were studied. The use of liposomes for metal mobilization is also explored. Low level radiation studies include delineation of the hematopoietic and other responses of dogs to continuous low level gamma irradiation, comparison of lifetime effects in mice of low level neutron and gamma irradiation, and study of the genetic effects of high LET radiation. Molecular Biology research developed two dimensional electrophoresis systems for diagnosis and detection of cancer and other diseases. Fundamental structural and biophysical investigations of immunoglobulins and other key proteins, studies of cell growth, and of molecular and cellular effects of solar UV light are included. Research in toxicology uses cellular, physiological, whole animal, and chronobiological end points and chemical separations to elucidate mechanisms and evaluate hazards of coal conversion byproducts, actinides, and toxic metals. Support facilities, educational activities, seminars, staff talks, staff, and funding agencies are reported. DOE

N83-36635# Oklahoma State Univ., Stillwater.
FACTORS CONTROLLING BLUE-GREEN ALGAE DOMINANCE IN A SOUTHWESTERN RESERVOIR
Dale Toetz Mar. 1983 48 p refs
(Contract DI-14-34-0001-1138)
(PB83-208892; W83-03109; OWRT-A-106-OKLA(1)) Avail: NTIS HC A03/MF A01 CSCL 06C

Blue-green algae dominate eutrophic impoundments in summer and may contribute nitrogen (N) to the N budget of the lake through nitrogen fixation (NF). The objective of this study was to determine how NF was cntrolled by the environment and how it was correlated with changes in algal community structure in Lake Hefner, Oklahoma, during the summer of 1981. Author (GRA)

N83-36636# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 17, NO. 4, JULY - AUGUST 1983
O. G. Gazenko, ed. 27 Sep. 1983 152 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 95 p
(JPRS-84412) Avail: NTIS HC A08

Research and development in space biology and aerospace medicine are reported. Topics discussed include: medical support of aviation and space missions; work and rest during long term spaceflights; pre and post flight ophthalmology; effects of hypokinesia-orthestatic stability; effects of weightlessness; biochemical effects; gravity effects on early embryogenesis; biological effects of high voltage stationary electric fields; nutrition; waste treatment for biological life support systems; circadian cycle and work shifts; genetics; long term effects; central nervous system and the change in organ and tissue iodine content during exposure to variable magnetic fields. For individual titles, see N83-36637 through N83-36661.

N83-36637# Joint Publications Research Service, Arlington, Va.
SOME DISTINCTIONS OF MEDICAL SUPPORT OF AVIATION AND SPACE MISSIONS **c52**
N. M. Rudnyy and I. D. Pestov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 1-8 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 4-9 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The specific features of the environment and human activities in aviation and space flights which distinguish the major relations in the system man vehicle environment as related to their medical support were compared. It is shown that in the aviation flight the man vehicle interaction plays the leading role while in the space flight the man environment interaction is more important. These differences are considered and medical and professional selection, prediction, medical monitoring and medical support of pilots and cosmonauts is discussed. E.A.K.

N83-36638# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF ORGANIZATION OF RATIONAL SCHEDULES FOR CREW WORK AND REST DURING A LONG-TERM SPACE-FLIGHT **c52**
A. N. Litsov and V. I. Bulyko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 9-13 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 9-12 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The work rest cycles of Salyut-6 crews were investigated. Several modifications were detected: 24 hour static regimens (65-70%) and altered regimens 35-30%) with longer or shorter work rest cycles. It is found that in prolonged space flights two regimens are allowed: principal regimens which are normal static regimes of work and rest used throughout the flight, and operational regimens which differ from 24 hour ones and are used no more than once every 7-10 days. E.A.K.

N83-36639# Joint Publications Research Service, Arlington, Va.
OPTOKINETIC NYSTAGMUS AND OPTOKINETIC STABILITY OF COSMONAUTS IN PREFLIGHT AND POSTFLIGHT PERIODS **c52**
L. N. Kornilova, Yu. V. Kreydich, I. K. Tarasov, and I. Ya. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 14-19 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 12-15 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The influence of space flight factors on optomotor reactions and optokientic resistance of 17 cosmonauts after prolonged and short-term flights is discussed. It is found that flight factors affect the nature of optomotor reactions and that there is a relationship between these reactions and initial resistance to optokinetic stimuli. The changes are functional and transient. The assessment of individual endurance of optokinetic factors, and the determination of the distinctions of optokinetic nystagmus in response to the delivered stimuli and in conjunction with the set of tests of vestibular function in cosmonauts is recommended. E.A.K.

N83-36640# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPOKINESIA IN ANTIORTHOSTATIC POSITION ON PULMONARY CIRCULATION AND GAS EXCHANGE **c52**
V. Ye. Vorobyev, V. R. Abdrakhmanov, I. V. Kovachevich, A. P. Golikov, L. L. Stazhadze, V. V. Bogomolov, S. G. Voronina, and L. G. Repenkova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 20-24 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 16-18 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Gas exchange and lung perfusion during 14 day head down tilt and immediately thereafter were investigated. Zonal rheography of the lungs and ECG's showed an increase during head down tilting in pulmonary circulation. A significant decrease in O2 tension and slight increase in CO2 tension of the arterial blood was detected. Immediately post test pulmonary circulation declined and metabolic acidosis developed simultaneously. Drugs reducing pulmonary hypertension are recommended for emergency medical aid in space flight. E.A.K.

N83-36641# Joint Publications Research Service, Arlington, Va.
CONTRAST TEMPERATURES IN SAUNA AS A MEANS OF ENHANCING MAN'S ORTHOSTATIC STABILITY **c52**
V. I. Sobolevskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 25-28 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 19-21 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Contrasting thermal effects in the sauna bath which help increase orthostatic tolerance were examined. It is considered that increase on tolerance may cause a lower increase of heart rate, an increase in pulse pressure and a smaller change in ECG and PCG in the standing position. The use of contrast thermal effects in the sauna bath to maintain and improve man's orthostatic tolerance is recommended. E.A.K.

N83-36642# Joint Publications Research Service, Arlington, Va.
EFFECT OF SEVEN DAYS WITHOUT GRAVITY LOAD ON VELOCITY AND STRENGTH OF HUMAN SKELETAL MUSCLES **c52**
L. S. Grigoryeva and I. B. Kozlovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 29-35 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 21-25 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The effect of 7 day water immersion on the velocity strength properties of the triceps and anterior tibial muscles was investigated. The exposure decrease the maximum strength of the leg extensors which seen in a large velocity range and during static movements. The decline of the contractile properties of the extensors is also manifested in a increase of the ratio of bioelectrical and mechanical effects of contraction which is pronounced during high load and isometric regimens. The strength properties of the tibial muscle diminished only during isometric contractions. The high rate with which the above changes developed and returned to normal after the exposure indicate a reflex nature and association with mechanisms of tonic disorders which are due to the lack of support loading. E.A.K.

N83-36643# Joint Publications Research Service, Arlington, Va.
MORPHOMETRIC AND GRAVIMETRIC STUDY OF RAT HEART DURING LONG-TERM HYPOKINESIA
A. S. Kaplanskiy, G. N. Durnova, and Ye. I. Ilina-Kakuyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 36-40 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 25-28 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Hearts of adult rats submitted to 30, 60, 90, 120 and 165 day hypokinesia were examined by histological, morphometric and massmetric methods. It is found that prolonged hypokinesia delayed rat growth and terminated heart growth. It is noted that the delayed increase of the heart mass of hypokinetic rats is induced by the discontinued growth of cardiomyocytes. The growth of the right and the left heart is inhibited in a similar degree. E.A.K.

N83-36644# Joint Publications Research Service, Arlington, Va.
LYMPHOID ORGANS OF MONKEYS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA (EXPERIMENTAL MORPHOLOGICAL STUDY)
G. N. Durnova and A. S. Kaplanskiy *In its* USSR Rept.: Space

Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 41-47 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 28-32 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The thymus, spleen and inguinal lymph nodes of monkeys exposed to head down tilt for 7 or 19 days were studied. It was shown that the exposure caused an acute stress which resulted in the thymus involution and hypoplasia of the lymphoid tissue of the spleen and lymph nodes. The exposure produced fluid redistribution which caused the spleen blood content to decrease and the mass of inguinal lymph nodes to increase. This was induced by partial pooling of the lymph flowing from the lower extremities. The exposure also led to autoimmune developments. It is indicated that long term hypokinesia may lead to decline of resistance to infection, impairment of immunobiological reactivity and allergization of the body. E.A.K.

N83-36645# Joint Publications Research Service, Arlington, Va.
EFFECT OF SPACEFLIGHT ABOARD COSMOS-1129 BIOSATELLITE ON ENZYME ACTIVITY IN RAT LIVER
S. Nemeth and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 48-53 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 33-37 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

After the 18.5 day Cosmos-1129 flight the activity of 7 glucocorticoid-stimulated enzymes of the rat liver was measured. Immediately postflight the activity of tyrosine aminotransferase, tryptophan pyrolase and serine dehydrogenase increased. These enzymes rapidly (within several hours) react to increased glucocorticoids. The activity of aspartate and alanine aminotransferases also increased. These enzymes require many days of a continuous effect of glucocorticoids. The glycogen concentration in the rat liver also grew. At R+6 the activity of tryptophan pyrolase and serine dehydrogenase decreased and that of the other enzymes returned to normal. The immobilization stress applied postflight led to an increased activity of tyrosine aminotransferase and tryptophan pyrolase. Evidence is given that after space flight rats are in an acute stress state, evidently, produced by the biosatellite recovery. R.J.F.

N83-36646# Joint Publications Research Service, Arlington, Va.
ROLE OF GRAVITY IN EARLY EMBRYOGENESIS OF THE TELEOST, BRACHIDANIO RERIO
Ye. M. Cherdantseva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 54-59 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 37-40 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The effect of turning and clinostating exposures on the early embryogenesis of the teleost B. rerio was investigated. The eggs turned immediately after fertilization with their animal pole downwards and kept so till the formation of the axial primordium developed in an absolutely normal way. Most eggs also developed normally during clinostating, when kept in the inclined and horizontal clinostats. During this exposure eggs of some clutches perished. They were those eggs which were unable to develop near the lower limits of the temperature range characteristic of B. rerio development (18-19.5 C). Direct involvement of environment factors in primary egg polarization (i.e., establishment of its polarity and bilateral organization) is unlikely, if only by virtue of variability of such factors. Gravity is the only exception, and the question of its involvement in early morphogenesis of animals definitely requires further investigation. Author

N83-36647# Joint Publications Research Service, Arlington, Va.
EFFECT OF CENTRIFUGING ON EARLY EMBRYOGENESIS OF THE TELEOST, BRACHIDANIO RERIO
Ye. M. Cherdantseva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 60-65 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 41-45 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The early embryogenesis of the teleost Brachidanio rerio was shown to be resistant to centrifugation. Beginning with the blastula stage, the development proceeds normally in 90% embryos centrifuged at 500 g for 1 h. Beginning with early developmental stages, embryos grow and develop normally when exposed to long-term centrifugation at 50 g. The exposure produces partial inhibitions of cytotomy (with nuclear division continued). This effect changes the proportions of the cellular and syncytial fractions of the embryo (blastoderm and periblast). The exposure to centrifugation also reveals the dorsoventral asymmetry of egg surface tension. Resistance to centrifugation is attributed to the fact that the polarization control is beyond the cell embryonic fraction. R.J.F.

N83-36648# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ADDITION OF NITROGEN TO INHALED OXYGEN ON EFFICACY OF TWO-HOUR DENITROGENATION BEFORE DECOMPRESSION FROM 760 TO 220 mm Hg c52
A. S. Barer, M. I. Vakar, G. F. Vorobyev, L. R. Iseyev, S. N. Filipenkov, and V. I. Chadov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 66-69 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 45-47 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The ground-based experimental study of denitrogenation by oxygen breathing showed that two-hour denitrogenation was inadequate if the breathing gas contained about 10% nitrogen or if the process included 3-10 min of air breathing. The reduction of the nitrogen content in the breathing gas to 0.4-5% eliminated severe forms of the decompression disease and decreased significantly the incidence of its mild forms to 3.2%. This allowed work of moderate load at the ambient pressure 220 mm Hg after two-hour breathing of oxygen with nitrogen admixture of no more than 5%. Author

N83-36649# Joint Publications Research Service, Arlington, Va.
FREE AND PROTEIN-BOUND PLASMA CORTICOSTERONE IN WHITE RATS IN THE PRESENCE OF HYPOXIA AND AFTER ADMINISTRATION OF ADRENOCORTICOTROPIC HORMONE
G. K. Abasheva and L. M. Mikhneva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 70-74 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 47-50 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

It was demonstrated that the plasma ratio of free and protein-bound corticosterone depends on the hypoxic degree. After two-hour hypoxia at an altitude of 10,000 m the trained and untrained animals exhibit a similar content of the free hormone (21%), with the content of total corticosterone being significantly lower in the trained rats. A study of variations in the content of free corticosterone rates exposed to hypoxia for 20, 45 and 120 minutes and adrenocorticotropin (ACTH) administration during the same time intervals showed that the binding capacity of transcortine changes 45 minutes after the beginning of hypoxia. R.J.F.

N83-36650# Joint Publications Research Service, Arlington, Va.
SOME BIOLOGICAL EFFECTS OF HIGH-VOLTAGE STATIONARY ELECTRIC FIELDS
V. V. Antipov, N. N. Dobrov, V. I. Drobyshev, L. V. Koroleva, M. D. Nikitin, S. V. Petrukhin, L. A. Semenova, and V. P. Fedorov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 75-80 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 50-54 (For primary

document see N83-36636 24-51)
Avail: NTIS HC A08

Experiments were carried out on 345 white mice using hematological and pathomorphological procedures. The constant electric field (CEF) was generated in a special laboratory device. The exposure to CEF of 50 and 100 kV/m for 20 s caused hematological and morphological changes typical of the anxiety stage of the adaptation syndrome. The exposure also produced morphological changes of reactive and destructive type in skeletal muscles and different segments of kinesthetic receptors. The level of the above changes appears to be directly related to the CEF strength. Author

N83-36651# Joint Publications Research Service, Arlington, Va.
VARIATION PULSIMETRY IN EVALUATING THE EFFECTS OF STATIONARY MAGNETIC FIELDS ON CARDIAC FUNCTION
N. P. Smirnova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 81-87 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 54-59 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

By variation pulsimetry changes in the cardiac rhythm of 30 rats exposed to a constant magnetic field (CMF) were examined. Three stages different in statistical parameters were distinguished: transient process when the electromagnet is turned on; shift of variation curves of the cardiac intervals to the right and development of bradycardia during exposure to CMF of 0.4 T (10-30 min) and 1.6 T (3 h); adaptation and rearrangement of the cardiac rhythm towards a higher frequency during and after 24 h exposure to CMF of 1.6 T. In some cases atropine prevented bradycardia during CMF exposure. In most rats under nembutal anesthesia the exposure caused an opposite effect, i.e., shift of variation curves of the cardiac intervals to the left and increase in heart rate. Author

N83-36652# Joint Publications Research Service, Arlington, Va.
SOME DISTINCTIONS OF NUTRITIONAL STATUS WHEN CONSUMING CANNED MEAT ON EMERGENCY SURVIVAL DIETS **c54**
I. G. Popov, P. A. Lozinskiy, A. A. Latskivich, and I. A. Romanova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 88-99 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 59-68 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Variations in the nutrient status of test subjects who for 5 days were given a survival diet made of 400 g canned meat were investigated. The energy expenditures of the test subjects were 3000-3200 kcal/day. The study was performed under moderate climate conditions. Anthropometric and biochemical parameters, as well as nitrogen, amino acid, carbohydrate and mineral metabolism were investigated. It was demonstrated that the survival diet of the above composition can be used by the flight personnel in a contingency situation under moderate climate conditions, provided that water supply is about 1 l/day. The study showed sporadic hypoglycemia, intensive ketonemia, heavy salt losses, and early protein deficiency. This should be taken into consideration when arranging rescue operations, rehabilitation nutrition and pilot training. It is understood that adequate preflight nutrition may be of great importance. R.J.F.

N83-36653# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF DEVELOPMENT OF HOUSEFLY LARVAE FOR UTILIZATION OF ORGANIC WASTE IN BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MAN **c55**
V. V. Nosov and Ye. G. Golubeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 100-106 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 68-71 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The development of Musca domestica L. larvae as utilizers of organic wastes in the biological life support system was investigated by methods of mathematical planning. The optimization of the process is based on the reduction to the canonical form of regression models set by second order polynomials. This approach was determining optimal conditions for larval development and substrate utilization with respect to 5 factors. On the basis of optimization results the following parameters were selected to ensure effective utilization of the substrate by larvae: the amount of substrate--150 g, its height--2.0 cm, temperature--34-35 deg, humidity--77%, larval density--10 larvae per g wet substrate. Author

N83-36654# Joint Publications Research Service, Arlington, Va.
EFFECT OF WORKING IN SHIFTS ON CIRCADIAN PATTERN OF BODY TEMPERATURE **c52**
A. I. Shchukin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 107-112 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 72-75 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Two groups of building and manufacturing workers - men of 19-20 years old with a work record of 1 year - were examined. The test subjects of the first group (10 subjects) worked throughout the year during the morning shift only, and the test subjects of the second group (5 subjects) during two shifts (one week - morning shift, another - evening shift). The test subjects were examined as follows: 1st group subjects once, and 2nd group subjects twice - the first time after one week of the morning shift and the second time after one week of evening shift. Diurnal variations in the rectal, sublingual and axillary temperatures were recorded continuously. During the two-shift work the shape of diurnal curves of body temperatures depended on the preceding shift; therefore, they showed rises at certain working hours. Unlike the one-shift work, the two-shift work was characterized by a change in the daily temperature minima to the right by 2-4 h. The amplitude and phase changes are viewed as a result of the stressogenic effect of the shift work. B.W.

N83-36655# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF STROKE AND MINUTE VOLUMES IN MONKEYS BY MEANS OF THORACIC TETRAPOLAR RHEOGRAPHY
G. S. Belkaniya and V. A. Dartsmeliya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 113-117 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 75-78 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

At the present time the most important significance is attributed to determination of stroke and minute volumes for evaluation of hemodynamics. For this reason, development of noninvasive methods acquires special importance, since they permit taking prolonged and repeated measurements of the most important cardiodynamic parameters. Determination of cardiac output by the method of thoracic tetrapolar rheography is one of the methods in current use that best meets the requirements for clinical tests and chronic experiments. Tetrapolar wiring of a biological object involves separate connection of generator and measuring circuits. The results of numerous studies have shown that the measuring electrodes are then situated in the region of a uniform high-frequency electric field, and this justifies calculation of stroke volume on the basis of Ohm's law, which relates voltage, current and impedance. B.W.

N83-36656# Joint Publications Research Service, Arlington, Va.
ADSORPTIVITY OF SULFUR-CONTAINING RADIOPROTECTIVE AGENTS **c52**
V. N. Seryakov and V. N. Shvets *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412)

27 Sep. 1983 p 118-122 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 78-80 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

At the present time, radioprotective agents have gained wide use in the study of the body's reactivity during spaceflights. The distribution, recording and evaluation of efficacy of radioprotective agents still cause some difficulties. Broad use is made in electrochemical and radiobiological studies of pulsed application of potential of positive and negative polarity in order to activate the surface of hard electrodes and measure partial oxygen tension in solution and animal tissues. It has also been shown that oscillographic polarography, application of high-speed potential, can be used to demonstrate electrochemically inert substances in solutions due to their adsorption on the electrode. We have tried here to utilize the principles of both methods to prove the existence of adsotrption in sulfur-containing radioprotective agents on a smooth Pt electrode and possibility of using the method of anode-cathode activation (ACA) to determine the rate of dissemination of these substances in mammalian tissues. B.W.

N83-36657# Joint Publications Research Service, Arlington, Va.
RAT THYROID HORMONES FOLLOWING FLIGHT ABOARD COSMOS-936 BIOSATELLITE
J. Knopp, L. Macho, R. A. Tigranyan, N. F. Kalita, and V. Strbak *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 126-128 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 83-84 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Histological studies of the rat thyroid after long term spaceflights revealed that there were some morphological signs of diminished function of this gland (reduction in volume of thyrocyte nuclei, shortening of epithelium, consolidation of colloid), as well as decrease in number and volume of C cell nuclei 5-12 h after landing. These changes were not present 25 days after the flight. It was found that thyroxine (T sub 4) entration of cosmonauts' blood plasma was increased on the concluding day of 13 day missions aboard Apollo, but 1 day after the flight there was complete normalization of T sub 4 level. analogous results were obtained for cosmonauts on the Skylab orbital station, in whom some decrease in blood plasma triiodothyronine (T sub 3) concentration was also demonstrated after 28-, 56- and 84-day missions, as well as elevation of thyrotropic hormone (TTH) level in 5 out of 9 cosmonauts. B.W.

N83-36658# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM SPACEFLIGHT ON CATECHOLAMINE CONTENT OF ISOLATED NUCLEI OF RAT BRAIN
R. Kvetnansky, R. A. Tigranyan, and J. Culman *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 129-132 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 84-86 (For primary document see N83-36636 24-51)
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A prolonged spaceflight is associated with numerous factors that affect neuroendocrine reactions. For this reason, it is quite justified to assume that changes occur in catecholamine (CA) metabolism in the brain under the influence of spaceflight factors. Considering current knowledge about the numerous functions of different parts of the brain, investigation of CA metabolism in the whole stem and hypothalamus is less informative and satisfactory. In recent years, good results have been obtained by the method of isolation of individual nuclei from different brain structures. The studies of CA metabolism in the rat hypothalamus, which were pursued in an experiment aboard Cosmos-1129 biosatellite, revealed that only some parts of the hypothalamus reacted in the form of change (drop) in CA level after the spaceflight, mainly the nucleus arcuatus, nucleus periventricularis and eminentia medialis. Author

N83-36659# Joint Publications Research Service, Arlington, Va.
CHROMOSOME ABERRATIONS IN BONE MARROW CELLS OF RATS SUBMITTED TO HYPERBARIC OXYGENATION
Ye. P. Guskov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 133-135 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 87-88 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

The genetic sequelae of hyperbaric oxygenation (HBO) have not been sufficiently investigated. An attempt was made here to demonstrate in rat bone marrow cells the cytogenetic consequences of HBO combined with the anticarcinogen, sarcolysin. Author

N83-36660# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM ADMINISTRATION OF OBSIDAN ON RAT RESISTANCE TO HYPOXIA AND THROMBOCYTE AGGREGATION DURING ADAPTATION TO MODERATE ALTITUDE (1600 METERS)
M. A. Aliyev, V. A. Lemeshenko, A. K. Bekbolotova, and G. K. Ryskulova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 136-139 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 88-90 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Adaptation of animals to moderate and high altitudes improves their resistance to hypoxia. The combination of adaptation to altitude and certain pharmacological agents enhances even more animal resistance. It is known that aggregation of thrombocytes induced by ADP and epinephrine is inhibited by a beta adrenoreceptor blocking agent, such as propranolol (obsidan, inderal). It depresses the release reaction, has a nonspecific effect on thrombocyte membranes, diminishing their adhesiveness. The object here was to determine the antihypoxia and antiaggregation properties of obsidan when given once and for a long period of time under two different ecological conditions, in the plains (Frunze) and at moderate altitude. B.W.

N83-36661# Joint Publications Research Service, Arlington, Va.
ROLE OF CENTRAL NERVOUS SYSTEM IN CHANGING ORGAN AND TISSUE IODINE CONTENT DURING EXPOSURE TO VARIABLE MAGNETIC FIELD
N. V. Marasakova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 140-143 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 90-92 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

Several researchers have noted the high sensitivity of the autonomic nervous system to magnetic fields (MF). In particular, it was demonstrated that the hypothalamus affects the thyroid via the hypophysis: increase in thyroid SH groups under the effect of exposure of the rat head to a variable magnetic field (VMF). In previous studies the compensatory effect of VMF with intensity of 0.11 mT and frequency of 50 Hz on parameters of protein and carbohydrate metabolism in rat blood serum, on levels of copper and iodine in organs in the case of 3 day exposure to VMF was demonstrated. It was also reported that there was activation of the thyroid with 60 day exposure to VMF of rats kept on their regular diet. An additional study was demonstrated to determine the role of the CNS in changing iodine content of organs and tissues during exposure to VMF. B.W.

N83-36662# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 43
5 Oct. 1983 95 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84475) Avail: NTIS HC A05

Research and development studies in the USSR were undertaken in many areas in the life sciences discpline. Subject

matter covered includes: agrotechnology; biochemistry; food technology; genetics; immunology; laser effects; medicine; microbiology; molecular biology; pharmacology and toxicology; and public health. For individual titles, see N83-36663 through N83-36664.

N83-36663# Joint Publications Research Service, Arlington, Va.
METHODOLOGICAL APPROACHES TO STUDY OF FACTUAL NUTRITION OF POPULATION AND OF STATE OF ITS HEALTH DUE TO NATURE OF NUTRITION c54
G. I. Bondarev and V. Ya. Vissarionova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 43 (JPRS-84475) 5 Oct. 1983 p 14-24 refs Transl. into ENGLISH from Vopr. Pitaniya (Moscow), no. 3, May - Jun. 1983 p 9-15 (For primary document see N83-36662 24-51)
Avail: NTIS HC A05

The state of nutrition can be characterized by the sum of indices of factual nutrition, physical development and the health of the population. When studying the status of nutrition of collectives, socio-demographic factors must also be studied: sick rate and work time lost, mortality rate, life expectancy, labor productivity, etc. Methods for evaluating adequacy of nutrition to meet demands of the organism. The study of factual nutrition (regimen, chemical composition, food energy value) is undertaken to uncover nutritional deficiencies and correct and eliminate them according to living conditions. B.W.

N83-36664# Joint Publications Research Service, Arlington, Va.
LIGHT PENETRATION OF OPAQUE PHYSICAL AND BIOLOGICAL MEDIUMS USING COMPRESSION c36
Gurgen Ashotovich Askaryan *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 43 (JPRS-84475) 5 Oct. 1983 p 47-56 refs Transl. into ENGLISH from Priroda (Moscow), no. 5, May 1983 p 72-78 (For primary document see N83-36662 24-51)
Avail: NTIS HC A05

One of the interesting applications of laser irradiation in medicine and biology which has emerged recently is its capacity to stimulate regenerative and immune processes in an organism's cells and tissues. This is apparently tied to the resonant nature of the absorption. The action of ultraviolet rays with strong therapeutic effects is also significant (for example, irradiation by nitrogen laser, harmonics of laser rays, and so on). All these types of irradiation, however, offer only shallow penetration. Research that was conducted at the Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences showed that it is possible to increase sharply the intensity of the light passing through, and thus also increase its therapeutic effect on tissues and mediums lying much deeper than the depth of penetration achieved without compression. The penetration of laser irradiation at great depths and the increase in its penetration with uniformly distributed or local compression (pressure) and puncturing of a layer of the opaque, compressed medium was studied. B.W.

N83-36268# Hokkaido Univ., Sapporo (Japan).
FUNDAMENTAL STUDIES FOR TREATMENT OF SULFATE BY MICROORGANISM. OPTIMUM CONDITION FOR BACTERIAL REDUCTION OF SULFATE ION IN SINGLE STAGE CONTINUOUS TREATMENT
Akihiko Okamura, Hiroshi Morita, Masao Tsurui, and Takakatsu Takamori *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 23-34 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
(Rept-1) Avail: NTIS HC A05/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N83-36665# National Inst. for Personnel Research, Johannesburg (South Africa).
HUMAN INFORMATION PROCESSING: NEUROLOGICAL SUBSTRATE
T. R. Taylor Nov. 1981 63 p refs
(CSIR-SR-PERS-331; ISBN-0-7988-1876-X) Avail: NTIS HC A04/MF A01

The neuropsychological literature in areas relevant to information processing was surveyed. A guide from another discipline for psychologically orientated students of information processing is offered. It is hoped that insights from neuropsychology will help to place psychological theorizing about information processing on a firmer basis. S.L.

N83-36666# Michigan State Univ., East Lansing. Dept. of Biomechanics.
A FOUNDATION FOR SYSTEMS ANTHROPOMETRY: LUMBAR/PELVIC KINEMATICS Final Report, 22 Feb. 1981 - 22 Feb. 1982
H. M. Reynolds and Sik-Chuen Leung Wright-Patterson AFB, Ohio AMRL 11 May 1983 104 p refs
(Contract F33615-81-C-0506; AF Proj. 2313)
(AD-A129517; AFAMRL-TR-83-016) Avail: NTIS HC A06/MF A01 CSCL 06/16

Research protocol and results from System Anthropometry Laboratory's three-dimensional investigation of the lumbar/pelvis linkage system are presented. A stereoradiographic system measures three-dimensional coordinates of implanted targets in the skeletal system of an unembalmed cadaver seated in a wooden seat conforming to Air Force specifications. The cadaver is experimentally positioned to obtain three-dimensional data on lumbar extension, flexion, and lateral sidebending motions. Data are analyzed to provide a screw axis description of the instantaneous axis of rotation for each change of position. In addition, position vectors are calculated that describe locations of the bones in the lumbar/pelvic linkage system and a point on the screw axis closest to the origin of the bone frame of reference. The data are presented in three-dimensional coordinates measured in a laboratory with a spatial accuracy of approximately + or minus 0.03 cm. The extensive references to measurement and measurement techniques studies offer a listing not presented elsewhere in the literature, or in other reviews of the literature, and with particular application to systems anthropometry, from the fields of anthropometry, osteology, kinematics, and three-dimensional measurement techniques. GRA

N83-36667# Oak Ridge National Lab., Tenn. Chemical Effects Information Center.
CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA: A DATA BASE Annual Report
M. Virginia Cone, Margaret F. Baidauf, Dennis M. Opresko, and Mary S. Uziel Oct. 1982 480 p
(Contract W-7405-eng-26)
(DE83-006369; ORNL/EIS-163-Vol-5-Pt-2; EPA-56015-82-003B; AR-4) Avail: NTIS HC A21/MF A01

A comprehensive data base of chemicals identified in human biological media (tissues and body fluids) has been established. This two-part volume is the annual publicaton of the data base for 1982. Data were obtained primarily from the open literature through manual searches (retrospective to 1974). The data now contains information on over 1000 different substances, all of which are listed by Chemical Abstracts Service (CAS) preferred names. The data base is published annually in tabular format with indices and chemical listings that allow specific searching. The purpose of the data base is to provide a centralized resource of body-burden data, and in no way is it intended to obviate the need for the user to ultimately refer to the original literature or data source. DOE

N83-36668# Rochester Univ., N. Y. School of Medicine and Dentistry.
MICROWAVE HAZARDS: RISK ASSESSMENT IN PERSPECTIVE
Sol M. Michaelson 1983 3 p Presented at the 18th Ann. Microwave Power Symp. Philadelphia, 18 Jul. 1983
(Contract DE-AC02-76EV-03490)

(DE83-010229; DOE/EV-03490/2268; UR-3490-2268; CONF-830715-1) Avail: NTIS HC A02/MF A01

In assessing the risk to humans from microwave radiation a distinction is drawn between a biological effect and a hazard. It is the author's contention there is no demonstrable biologic effect that may be hazardous to health or safety or to the general biological environment as a result of the ambient levels of electromagnetic energy emitted by microwave emitting devices and communications systems. DOE

N83-36669# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Hearing, Bioacoustics and Biomechanics.

OVERVIEWS OF EMERGING RESEARCH TECHNIQUES IN HEARING, BIOACOUSTICS AND BIOMECHANICS: PROCEEDINGS OF THE 1981 MEETING Annual Report

1982 142 p refs Meeting held in Washington, D.C., 13-14 Nov. 1981 Sponsored in part by ONR

(PB83-218016) Avail: NTIS HC A07/MF A01 CSCL 06D

Hair function, transduction process of hair cells, and speech synthesis are discussed. Machine recognition of words; neuromagnetic analysis of sensory systems; tinnitus; tactile communication of speech; and biodynamic research are also included. GRA

N83-36670# Environmental Protection Agency, Corvallis, Oreg. Environmental Research Lab.

INTRASPECIFIC VARIABILITY IN METABOLIC RESPONSES TO SO2

David T. Tingey and David M. Olszyk Jun. 1983 72 p refs (PB83-215103; EPA-600/D-83-048) Avail: NTIS HC A04/MF A01 CSCL 06T

Variation in metabolic responses to sulfur dioxide is widespread within many plant species. Plant responses are a consequence of a series of biochemical and physiological events beginning with SO2 flux into plant and progressing through perturbation, and homeostasis, and ending with foliar injury and/or effects on growth and yield. Gas-phase and liquid-phase conductance are important determinations of SO2 flux. However, the relationship between variation in these factors and plant response is incompletely understood-at least in part because of difficulties with SO2 gas-exchange methodology. Perturbation events occurring primarily in the chloroplast, and homeostatic mechanisms have received only brief attention. Author (GRA)

N83-36671# Science Applications, Inc., Los Angeles, Calif.

CARBON MONOXIDE INTRUSION IN SUSTAINED-USE VEHICLES Final Report

R. A. Ziskind, M. B. Rogozen, I. Rosner, and T. Carlin Mar. 1983 174 p refs

(Contract EPA-68-02-3220)

(PB83-209999; SAI-1-068-80-535; EPA-600/4-82-002) Avail: NTIS HC A08/MF A01 CSCL 06E

Section 226 of the Clean Air Act Amendments of 1977 directed the USEPA to perform a study of carbon monoxide (CO) exposures in the passenger area of sustained use vehicles, i.e., buses taxis, and police cars. A field investigation of vehicle CO levels in two metropolitan areas was conducted. Study objectives were to determine if CO concentrations in the passenger area of sustained-use vehicles is a health concern; to identify conditions and vehicle types conductive to high interior CO exposures, and intrusion mechanisms for such vehicles; and to recommend steps for identifying hazardous vehicles/driving conditions and for reducing CO exposures. CO was measured with passive dosimeters, active personal samplers, and continuous electrochemical analyzers; a tracer gas detection system was used to identify intrusion pathways. Author (GRA)

N83-36624# Joint Publications Research Service, Arlington, Va.

ADVICE ON PROLONGING FLYING CAREERS

N. Rudnyy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 41 (JPRS-84296) 12 Sep. 1983 p 1-5 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 5, 1983 p 40-41 (For primary document see N83-36623 24-51)

Avail: NTIS HC A05

N83-36626# Joint Publications Research Service, Arlington, Va.

AN EXPERT'S OPINION ABOUT FUTURE SPACEFLIGHTS

O. G. Gazenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 1-2 Transl. into ENGLISH from Sov. Rossiya (Moscow), 8 Apr. 1983 p 4 (For primary document see N83-36625 24-51)

Avail: NTIS HC A05

N83-36629# Joint Publications Research Service, Arlington, Va.

EQUALIZATION OF URBAN AND RURAL MEDICAL SERVICES DISCUSSED

P. Petrov and G. Popov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 44 (JPRS-84505) 11 Oct. 1983 p 59-65 refs Transl. into ENGLISH from Nar. Khoz. Kazakhstana (Alma Ata), no. 5, May 1983 (For primary document see N83-36625 24-51)

Avail: NTIS HC A05

N83-36637# Joint Publications Research Service, Arlington, Va.

SOME DISTINCTIONS OF MEDICAL SUPPORT OF AVIATION AND SPACE MISSIONS

N. M. Rudnyy and I. D. Pestov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 1-8 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 4-9 (For primary document see N83-36636 24-51)

Avail: NTIS HC A08

N83-36638# Joint Publications Research Service, Arlington, Va.

PRINCIPLES OF ORGANIZATION OF RATIONAL SCHEDULES FOR CREW WORK AND REST DURING A LONG-TERM SPACEFLIGHT

A. N. Litsov and V. I. Bulyko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 9-13 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 9-12 (For primary document see N83-36636 24-51)

Avail: NTIS HC A08

N83-36639# Joint Publications Research Service, Arlington, Va.

OPTOKINETIC NYSTAGMUS AND OPTOKINETIC STABILITY OF COSMONAUTS IN PREFLIGHT AND POSTFLIGHT PERIODS

L. N. Kornilova, Yu. V. Kreydich, I. K. Tarasov, and I. Ya. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 14-19 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 12-15 (For primary document see N83-36636 24-51)

Avail: NTIS HC A08

N83-36640# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOKINESIA IN ANTIORTHOSTATIC POSITION ON PULMONARY CIRCULATION AND GAS EXCHANGE

V. Ye. Vorobyev, V. R. Abdrakhmanov, I. V. Kovachevich, A. P. Golikov, L. L. Stazhadze, V. V. Bogomolov, S. G. Voronina, and L. G. Repenkova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 20-24 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 16-18 (For primary document see N83-36636 24-51)

Avail: NTIS HC A08

N83-36641# Joint Publications Research Service, Arlington, Va.

CONTRAST TEMPERATURES IN SAUNA AS A MEANS OF ENHANCING MAN'S ORTHOSTATIC STABILITY

V. I. Sobolevskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 25-28 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 19-21 (For primary document see N83-36636 24-51)

Avail: NTIS HC A08

N83-36642# Joint Publications Research Service, Arlington, Va.

EFFECT OF SEVEN DAYS WITHOUT GRAVITY LOAD ON VELOCITY AND STRENGTH OF HUMAN SKELETAL MUSCLES

L. S. Grigoryeva and I. B. Kozlovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 29-35 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 21-25 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

N83-36648# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ADDITION OF NITROGEN TO INHALED OXYGEN ON EFFICACY OF TWO-HOUR DENITROGENATION BEFORE DECOMPRESSION FROM 760 TO 220 mm Hg
A. S. Barer, M. I. Vakar, G. F. Vorobyev, L. R. Iseyev, S. N. Filipenkov, and V. I. Chadov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 66-69 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 45-47 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

N83-36654# Joint Publications Research Service, Arlington, Va.
EFFECT OF WORKING IN SHIFTS ON CIRCADIAN PATTERN OF BODY TEMPERATURE
A. I. Shchukin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 107-112 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 72-75 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

N83-36656# Joint Publications Research Service, Arlington, Va.
ADSORPTIVITY OF SULFUR-CONTAINING RADIOPROTECTIVE AGENTS
V. N. Seryakov and V. N. Shvets *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 118-122 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 78-80 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N83-36672*# Columbia Univ., New York. Psychophysics Lab.
[HUMAN ANNOYANCE RESPONSE TO AIRCRAFT NOISE] Final Technical Report
Eugene Galanter 31 Jul. 1983 106 p refs
(Contract NsG-1550)
(NASA-CR-174462; NAS 1.26:174462) Avail: NTIS HC A06/MF A01 CSCL 05J

Human annoyance response to aircraft noise is studied. Subject matter covered includes: emotional response to acoustic noise; loudness differences and scaling techniques. For individual titles, see N83-36673 through N83-36675.

N83-36673*# Columbia Univ., New York. Psychophysics Lab.
[HUMAN ANNOYANCE RESPONSE TO AIRCRAFT NOISE, INTRODUCTION] Final Technical Report
Eugene Galanter *In its* Human Annoyance Response to Aircraft Noise 31 Jul. 1983 p 1-2 (For primary document see N83-36672 24-53)
Avail: NTIS HC A06/MF A01 CSCL 05J

The objective of these efforts was to find ways to control the salient features of the annoyance function, and so reduce community annoyance responses. It was found that changing identified parameters of a model could lead to altered response. Environmental variables that can be located by a theoretical model may offer a high benefit/cost ratio in effecting a reduction of annoyance. Multiple exposure models of human annoyance were developed that broke with mere acoustic additivity of one or another kind. A new scaling technique was developed that permits the assignment of numerical values to aversive or desirable events.
B.W.

N83-36674*# Columbia Univ., New York. Psychophysics Lab.
TEMPORAL CHARACTERISTICS OF EMOTIONAL RESPONSE: A DECAY MODEL OF ANNOYANCE RESPONSE TO ACOUSTIC NOISE Final Technical Report
In its Human Annoyance Response to Aircraft Noise 31 Jul. 1983 p 4-45 refs (For primary document see N83-36672 24-53)
Avail: NTIS HC A06/MF A01 CSCL 05J

Blatz demonstrated in 1925 that physiological responses to a fear-provoking stimulus increase sharply at the onset of the stimulus and eventually return to their respective resting states. If physiological responses to emotion-provoking stimuli decay after the onset of the stimuli, then it is hypothesized that so will the emotional state (subject, of course, to cognitive and other contextual factors, Buck, 1976; Schachter & Singer, 1962). A series of experiments are proposed to demonstrate the existence of this change in emotional state as well as to estimate temporal parameters for specific emotion-provoking situations. Author

N83-36675*# Columbia Univ., New York. Psychophysics Lab.
SCALING LOUDNESS DIFFERENCES BY INTRA-MODAL MATCHING: EVIDENCE FOR A SINGLE SCALE UNDERLYING LOUDNESS AND LOUDNESS DIFFERENCE Final Technical Report
Richard Dorian Popper *In its* Human Annoyance Response to Aircraft Noise 31 Jul. 1983 p 46-104 refs (For primary document see N83-36672 24-53)
Avail: NTIS HC A06/MF A01 CSCL 05J

The perception of loudness was studied in four experiments. In Experiments 1 and 2 (difference matching), subjects judged the magnitude of loudness differences by adjusting the loudness of a single tone to equal the loudness difference between a pair of tones. Seventy-two tone pairs were used, contructed from nine sound pressure levels of a 1000 Hz tone ranging from 46-94 dB (Experiment 1) of 55-95 dB (Experiment 2). In Experiment 3 (difference estimation), subjects magnitude-estimated the loudness differences of the same tone pairs as in Experiment 2, and in Experiment 4 they magnitude estimated the loudness of the individual tones used to construct the tone pairs. The same subjects served in Experiments 2-4, and binaural listening through earphones was used throughout. Author

N83-36676# Rice Univ., Houston, Tex. Dept. of Psychology.
THE EFFECT OF TASK CHARACTERISTICS ON THE AVAILABILITY HEURISTIC FOR JUDGEMENTS UNDER CERTAINTY
Gail Fontenelle May 1983 75 p refs
(Contract N00014-82-C-0001; NR Proj. 197-074)
(AD-A130178; TR-83-1) Avail: NTIS HC A04/MF A01 CSCL 12/1

The present study sought to generalize the effect of the availability heuristic to more complex tasks and across various task categories. The experimental design involved the manipulation of event characteristics in order to induce a heuristic processing strategy for designated available events. The effect of these manipulations was investigated for three types of response measures and across a range of event frequencies. Results demonstrated the generalizability of the availability heuristic across complex tasks and three types of response measures--frequency estimation, probability estimation, and choice predictions. The availability of an event in memory produced an overestimation of the frequency and probability of event occurrences. Similarly, choice predictions judged available events as more likely to occur. However, this effect was not consistent across all levels of assigned event frequencies. The present study extended the generalizability of the availability heuristic to more complex tasks and provided an exploratory step toward defining the degree to

which basic findings hold across a range of task characteristics. GRA

N83-36677# Kansas Univ., Lawrence. Dept. of Psychology.
ITEM RESPONSE THEORY: SOME STANDARD ERRORS Final Report
David Thissen (Educational Testing Service) and Howard Wainer Brooks AFB, Tex. AFHRL May 1983 41 p refs
(Contract F41689-81-C-0012; AF Proj. 2313)
(AD-A129804; AFHRL-TP-83-12) Avail: NTIS HC A03/MF A01 CSCL 05/9

The mathematics required to calculate the asymptotic standard errors of the parameters of three commonly used logistic item response models is described and used to generate values for some common situations. It is shown that the maximum likelihood estimation of a lower asymptote reduces the accuracy of estimation of a location parameter. If one requires accurate estimates of location parameters (e.g., for purposes of test linking/equating or for computerized adaptive testing), the sample sizes required for acceptable accuracy may be so large as to make maximum likelihood estimation infeasible in most applications. It is suggested that other estimation methods be used if the three-parameter model is applied in these situations. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N83-36678# Carnegie-Mellon Univ., Pittsburgh, Pa. Inst. for Robotics.
A PROTOTYPE TACTILE SENSOR ARRAY Interim Report
James P. Christ and Arthur C. Sanderson 15 Sep. 1982 48 p refs Sponsored in part by NSF
(AD-A126362; CMU-RI-TR-82-14) Avail: NTIS HC A03/MF A01 CSCL 09/5

Although there are many potential applications for a tactile sensor array, very few practical implementations of such a sensor have been demonstrated. A practical tactile array sensor needs to be very durable, have a high resolution, have a small physical size, be relatively insensitive to noise, and have a compliant surface. In addition there is both physical and electrical coupling between elements of the array which should be eliminated or reduced as much as possible. In order to investigate some of these problems, a prototype tactile sensor was constructed. The sensor was made of a sheet of conductive foam sandwiched between layers of conductors. When the foam is compressed at some point, the resistance through the foam decreases. By selecting the appropriate conductor on each side of the foam, the resistance at any one of 256 points could be measured. The spatial resolution of the sensor was 1/4 inch. As a sample application, an object recognition system was implemented using the sensor. B.W.

N83-36679# Carnegie-Mellon Univ., Pittsburgh, Pa. The Robotics Inst.
DYNAMICALLY STABLE LEGGED LOCOMOTION
March H. Raibert, H. Benjamin Brown, Jr., Michael Chepponis, Eugene Hastings, S. Murthy Seshashayee, and Francis C. Wimberly 27 Jan. 1983 125 p refs
(ARPA Order 4148)
(AD-A126369; CMU-RI-TR-83-1) Avail: NTIS HC A06/MF A01 CSCL 14/2

Balance and dynamic stability in legged systems are studied. Balance in 2D can be achieved with a surprisingly simple control system. The control system has three separate parts, one that controls hopping height, one that controls the velocity of forward travel, and one that controls body attitude. A physical 2D one-legged hopping machine that employs such a three-part control system hops in place, runs from place to place at speeds of up to 2.7 mph, maintains its balance when distrubed, and leaps over small obstacles. Control of locomotion in 3D can build upon the results obtained in 2D. Simulations suggest that a 3D one-legged machine could run and balance using the same three part controller developed for 2D, provided that additional extra-planar mechanisms operate to suppress roll, yaw, and lateral motions. A physical one-legged system was designed and built that will permit experimentation in the control of balance in 3D. The device has a simple pneumatic leg that is positioned by a hydraulic hip. It will hop on an open floor without a system of physical constraints. A method for obtaining balance that uses tabulated data was developed. The method was extended by showing that the volumous tabular data can be approximated by a polynomial surface of moderate degree, without much loss of control precision. GRA

N83-36680# Carnegie-Mellon Univ., Pittsburgh, Pa. The Robotics Inst.
ARM DYNAMICS SIMULATION
Neil M. Swartz 23 Nov. 1982 27 p
(Contract N00014-82-K-0503)
(AD-A126371; CMU-RI-TR-82-17) Avail: NTIS HC A03/MF A01 CSCL 12/1

The ability to mathematically model the movement of a robot manipulator is a prerequisite to the understanding of the key factors that influence a manipulator's performance. This paper presents a manipulator model which has been used to simulate and control a real robot arm. A method of describing the arm by its rotational characteristics, a set of equations called the Inverse Arm, and an algorithm called the Forward Arm are presented. The Forward Arm simulates the movement of an arm and the Inverse Arm provides a means of computing the correct voltages to apply to an arm to achieve a desired movement. Author

N83-36681# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Human Engineering Div.
AN ANNOTATED BIBLIOGRAPHY OF UNITED STATES AIR FORCE ENGINEERING ANTHROPOMETRY - 1946 TO 1983
Kathleen M. Robinette May 1983 103 p Supersedes AMRL-TR-76-58
(AF Proj. 7184)
(AD-A129981; AFAMRL-TR-83-045; AMRL-TR-76-58) Avail: NTIS HC A06/MF A01 CSCL 05/5

This report contains the titles, authors, publication/source information, and the abstracts of 202 technical reports and articles published by the Air Force Aerospace Medical Research Laboratory from 1946 to 1983. It is a detailed document of the scope of the effort of the Air Force in the field of engineering anthropometry to provide the information on human body size and biomechanical characteristics of Air Force personnel required for the development and evaluation of Air Force systems, personal protective equipment, and clothing. Author (GRA)

N83-36682# Naval Ocean Systems Center, San Diego, Calif.
NOSC/ONR ROBOTICS BIBLIOGRAPHY, 1961 - 1981
S. Y. Harmon, G. R. McDevitt, M. Thompson, R. Argo, S. Ferrone, D. Brubaker, and D. Grace Sep. 1982 97 p
(RR0140901)
(AD-A130591; NOSC/TD-539) Avail: NTIS HC A05/MF A01 CSCL 05/2

This document contains a bibliography of the literature directly related to robotics published in the period from 1961 to 1981. This bibliography contains 1066 references. These references are organized into ten topical categories including: general and historical topics; modelling, simulation, design, testing and evaluation, sensors and sensor data processing: operating systems, software development, programming languages and computer architectures, knowledge management; communications and direct robot/human interactions; dynamics and control; effectors; systems and applications, and safety, human factors, standards, management, social, economic and political issues. GRA

N83-36683# Hershey (Milton S.) Medical Center, Hershey, Pa. Dept. of Behavioral Science.
MEASUREMENT OF TASK PERFORMANCE ON THE BASIS OF

THE TIME/EVENT MATRIX: AN EXTENSION OF METHODS
Siegfried Streufert Mar. 1983 30 p
(Contract N00014-80-C-0581)
(AD-A129848; TR-12-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/8

Previously reported measures of complex task performance are supplemented with a number of new measures. Formulas for calculating all measures now utilized are presented. Data collection on the basis of the time/event matrix is explained. Information about the print-out numbers of the various measures for some recently developed complex man-machine simulations is provided. Author (GRA)

N83-36684# Army Research Inst. of Environmental Medicine, Natick, Mass.
COMPARISON OF AIR SHOWER AND VEST AUXILIARY COOLING DURING SIMULATED TANK OPERATIONS IN THE HEAT
Michael M. Toner, Lawrence L. Drolet, Clement A. Levell, Leslie Levine, and Leander A. Stroschein Apr. 1983 39 p refs
(DA Proj. 3E1-62777-A-879)
(AD-A130416; USARIEM-T-2/83) Avail: NTIS HC A03/MF A01 CSCL 06/19

An evaluation of the effectiveness of air shower and vest auxiliary cooling was carried out on two tank crews in combat vehicle crewmen clothing and chemical protective clothing. The M1E1 Main Battle Tank was parked in a climatic chamber with environmental conditions of 91 F dry bulb, and 78 F wet bulb temperature. Crewmen performed standard tank exercises in a closed hatched tank for a duration of 2-hours and 45 minutes. Heart rate, rectal and skin temperatures were monitored continuously on each crewmen. Final rectal, mean body and skin temperatures were statistically higher (p less than 0.05) during air shower (99.7, 98.6 and 96.3 F, respectively) compared to vest auxiliary cooling (99.0, 95.2 and 87.6 F, respectively). Final heart rate responses were higher (p less than 0.05) during air shower compared to vest cooling (112 and 91 beats per minute, respectively) for the crews. Total sweat losses were also greater (p less than 0.01) during air shower (1.29 liters) compared to vest test (0.64 liters). One crew attempted the exposure with usage of the M13A1 particulate filter in operation. This exposure was discontinued following the incapacitation of two crewmen within 84 minutes, though thermal strain was only moderate. It is clear that vest auxiliary cooling is more effective for crewmen cooling than an air shower. It must also be emphasized that in these ambient conditions, an air shower provides adequate cooling power. GRA

N83-36685# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
COLD REGIONS ENVIRONMENTAL PROTECTION AND DURABILITY TEST OF CLOTHING Final Report
8 Jul. 1983 28 p refs
(AD-A130482; TOP-10-2-510) Avail: NTIS HC A03/MF A01 CSCL 06/17

This TOP prescribes methods for evaluating the durability and protective qualities of clothing developed for cold regions use. It contains procedures for evaluating wind, cold, and snow protection, physical, and thermal durability characteristics. It describes the necessary facilities and instrumentation requirements for test accomplishment. Author (GRA)

N83-36686# Massachusetts Inst. of Tech., Cambridge. Man-Machine Systems Lab.
SUPERVISORY CONTROL OF REMOTE MANIPULATORS, VEHICLES AND DYNAMIC PROCESSES: EXPERIMENTS IN COMMAND AND DISPLAY AIDING Final Report
Thomas B. Sheridan Mar. 1983 104 p refs
(Contract N00014-77-C-0256)
(AD-A129678) Avail: NTIS HC A06/MF A01 CSCL 05/8

This report is about supervisory control, an increasingly prevalent form of man-machine system wherein a human operator controls a process as the supervisor of a computer. The computer, in turn, may perform limited automatic control or it may process and display information from sensors. The particular context of interest here is supervisory control of manipulators and vehicles for remote inspection and work in the deep ocean. After giving a more detailed definition of supervisory control and providing examples, the report reviews a number of experimental studies conducted recently at the MIT Man-Machine System Laboratory. These are divided into two groups. The first group of studies is concerned with computer mediation in command and control of manipulation. The next group of experimental studies examines computer mediation in processing sensed information and displaying it to the human supervisor. A brief conclusion reviews how these experiments fit together and speculates on problems and prospects for supervisory control in manipulation, vehicle and process control, and other areas. GRA

N83-36687# University of Southern California, Marina del Rey. Information Sciences Inst.
THE CUE (CONSISTENT UNDERLYING ENVIRONMENT) PROJECT
Thomas Kaczmarek, William Mark, and David Wilczynski May 1983 17 p refs
(Contract MDA903-81-C-0335)
(AD-A129696; ISI/RS-83-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

The goal of the CUE Project is to produce a system environment in which the data and functions of different interactive services can be combined to perform a single computation task. Construction of this environment will require research on data representation, program functionalization, user interface design, and selection of appropriate levels, for inter-machine communication. CUE is designed to take advantage of the knowledge-based system technology being developed in the Consul project. The CUE project will result in a running system demonstrating integrated services and exhibiting automatic interaction with the Consul system when required. Author (GRA)

N83-36688# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
SCIENTIFIC/ENGINEERING WORK STATIONS: A MARKET SURVEY Final Report
James R. Carlberg May 1983 94 p
(AD-A129394; DTNSRDC/CMLD-83/07) Avail: NTIS HC A05/MF A01 CSCL 05/1

The David Taylor Naval Ship R&D Center (DTNSRDC), along with the white-collar segment of American business, is confronted with flat or declining productivity in the office, rising personnel costs, personnel ceilings and reductions, and a shortage of skilled workers, especially within the technical and scientific areas. Spurred by the development of powerful microprocessors and new software, designers of advanced intelligent workstations are developing a new class tool for technical personnel. These workstations are growing as tools to increase the productivity of scientists, engineers and managers. Five aspects go into making an efficient, productive workstation. These aspects are a flexible processor, general purpose and application oriented software, sophisticated graphics, local area network communications, and data base management. This report documents the results of a market survey to identify systems that can potentially meet the requirements for engineering workstations. Additionally, workstation application requirements for some of the Center's departments are discussed. System requirements are discussed and are presented as a functional description. Author (GRA)

N83-36689# Army Aeromedical Research Lab., Fort Rucker, Ala.
ATTENUATION VARIATION OBTAINED WITH SUBJECT FIT OF THE SIGMA ENGINEERING TRIPLE-FLANGE INSERT HEARING PROTECTIVE DEVICE
Jerod L. Goldstein Jun. 1983 24 p refs
(DA Proj. 3E1-62777-A-878)
(AD-A130676; USAARL-83-11) Avail: NTIS HC A02/MF A01 CSCL 06/17

The sound attenuation provided by a preformed-flange insert hearing protective device was determined when the user had no

fitting instructions or training in the use of the device. This situation does occur in many instances among US Army personnel. The results of this study indicate that lack of training in the use of the Sigma Engineering Triple-Flange earplug reduces the available sound attenuation provided by the earplug by approximately 5 dB at most frequencies. Furthermore, the attenuation was more variable than that found in the experimenter fit group of subjects tested. Adequate fitting instructions should be developed and issued with the hearing protectors. Users should be trained in the use of the device. Author (GRA)

N83-36690# International Trade Administration, Washington, D.C.
HIGH TECHNOLOGY INDUSTRIES: PROFILES AND OUTLOOKS. THE ROBOTICS INDUSTRY
1983 53 p ref
(PB83-211144) Avail: NTIS HC A04/MF A01; also available in set of 4 reports HC E99 as PB83-211128 CSCL 05C

This study is designed to (1) assess the international competitive position of the U.S. Robotics Industry; (2) pinpoint the major foreign and domestic challenges to American robot producers; and (3) suggest possible options for USG policies affecting the sector's international standing. GRA

N83-36691# Fitzpatrick Engineering, Warsaw, Ind.
COMPREHENSIVE DOCUMENTATION OF DRIVER (DRACR) (DRIVER AIR CUSHION - ROTATION) AND PASSENGER (PAC) (PASSENGER AIR CUSHION) COMPUTER MODELS, REVISION A Final Report
Michael U. Fitzpatrick 7 Aug. 1982 139 p refs
(Contract DTNH22-81-C-07550)
(PB83-207035; DOT-HS-806-311-Rev-A) Avail: NTIS HC A07/MF A01 CSCL 13F

This manual is written to give the user of the DRACR computer model the specific information he will need to set up the input file, run the program, and interpret the results. This model describes the interaction between the driver of a vehicle and an air cushion restraint system. The air cushion is mounted to a steering whell/steering column assembly which is modeled to stroke and rotate during the crash. Author (GRA)

N83-36692# Fitzpatrick Engineering, Warsaw, Ind.
DOCUMENT THE PARAMETER SENSITIVITY STUDY: OUTLINE A SYSTEMS ANALYSIS APPROACH AND PERFORM A SENSITIVITY STUDY OF THE PASSENGER AIR CUSHION (PAC COMPUTER MODEL Final Report, Sept. 1981 - Sep. 1982
Michael U. Fitzpatrick 26 Aug. 1982 187 p
(Contract DTNH22-81-C-07550)
(PB83-207290; DOT-HS-806292) Avail: NTIS HC A09/MF A01 CSCL 13L

This report investigates the design and crash environment factors which influence the degree of protective capability offered by an inflatable restraint system to a three year old, forward positioned child. Two separate restraint system designs are investigated - a Chevrolet Citation system designed by MCR Technology and a DeLorean system designed by Fitzpatrick Engineering. The method of investigation is by using the PAC computer model in which various design and crash factors are separately simulated on the computer. The main objective of this study is to ascertain which of these factors influence injury most strongly so that the designer can design systems which minimize injury to the forward positioned child as well as the normally seated adult. Author (GRA)

N83-36652# Joint Publications Research Service, Arlington, Va.
SOME DISTINCTIONS OF NUTRITIONAL STATUS WHEN CONSUMING CANNED MEAT ON EMERGENCY SURVIVAL DIETS
I. G. Popov, P. A. Lozinskiy, A. A. Latskivich, and I. A. Romanova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 88-99 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 59-68 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

N83-36663# Joint Publications Research Service, Arlington, Va.
METHODOLOGICAL APPROACHES TO STUDY OF FACTUAL NUTRITION OF POPULATION AND OF STATE OF ITS HEALTH DUE TO NATURE OF NUTRITION
G. I. Bondarev and V. Ya. Vissarionova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 43 (JPRS-84475) 5 Oct. 1983 p 14-24 refs Transl. into ENGLISH from Vopr. Pitaniya (Moscow), no. 3, May - Jun. 1983 p 9-15 (For primary document see N83-36662 24-51)
Avail: NTIS HC A05

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N83-36653# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF DEVELOPMENT OF HOUSEFLY LARVAE FOR UTILIZATION OF ORGANIC WASTE IN BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MAN
V. V. Nosov and Ye. G. Golubeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 4, Jul. - Aug. 1983 (JPRS-84412) 27 Sep. 1983 p 100-106 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 4, Jul. - Aug. 1983 p 68-71 (For primary document see N83-36636 24-51)
Avail: NTIS HC A08

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N83-36693# Carnegie-Mellon Univ., Pittsburgh, Pa. The Robotics Inst.
RAPIDbus: ARCHITECTURE AND REALIZATION
John C. Willis and Arthur C. Sanderson Nov. 1982 89 p refs
(Grant NSF ECS-79-23893)
(AD-A126363; CMU-RI-TR-82-13) Avail: NTIS HC A05/MF A01 CSCL 09/2

A synchronous multiprocessor (RAPIDbus) designed to support sensory processing, image understanding, and control applications is described. Up to eight board level masters interact with up to eight slaves along a time-multiplexed implementation of a crossbar switch. Two implementations are considered, one based on an advanced Shottky logic with a bus bandwidth of 16 Mhz and a Versabust host interface. The second implementation, based on an ECL/TTL gate array, permits an estimated 6-4 Mhz of bus bandwidth and a Versabus/Multibus host interface. Segmented memory management, a multicast capability between one master and multiple destinations, and a standardized host interface aid in making RAPIDbus an appropriate architecture for robotic applications. M.G.

N83-36694# Iowa Univ., Iowa City. Dept. of Electrical Engineering.
APPLICATIONS OF TIME DELAYS AND MICROPROCESSORS IN CONTROL SYSTEM DESIGN Final Report
Dong H. Chyung Feb. 1982 81 p
(Contract DAAK10-78-C-0325)
(AD-A129148) Avail: NTIS HC A05/MF A01 CSCL 12/1

One of the problems which occur occasionally in designing a satisfactory controller for a deterministic controls systems is the need of the state variables which are not directly measurable. Luenberger proposed a scheme which approximately reconstructs inaccessible variables. No methods, however, are currently available for exactly reconstructing the missing variables from observable variables. In this paper a method is presented for exactly reconstructing the inaccessible variables. It uses measurable variables, their delayed values and the control variables on the maximum delay interval. As can be seen in examples, the method may give satisfactory results in certain cases and can be easily implemented using a microprocessor. GRA

N83-36695# Yale Univ., New Haven, Conn. Dept. of Computer Science.
THE CONSENSUS PROBLEM IN UNRELIABLE DISTRIBUTED SYSTEMS: A BRIEF SURVEY
Michael J. Fischer Jun. 1983 19 p refs Presented at the Intern. Conf. on Foundations of Computation Theory, Borgholm, Sweden, 21-27 Aug. 1983
(Contract N00014-82-K-0154; Grant NSF MCS-81-16678; NR Proj. 049-456)
(AD-A129834; YALE/DCS/RR-273) Avail: NTIS HC A02/MF A01 CSCL 12/1

Agreement problems involve a system of processes, some of which may be faulty. A fundamental problem of fault-tolerant distributed computing is for the reliable processes to reach a consensus. The author surveys the considerable literature on this problem that has developed over the past few years and give an informal overview of the major theoretical results in the area. GRA

N83-36696# Los Alamos Scientific Lab., N. Mex.
U: THE UNIVERSAL UTILITY CONTROLLER
Charles Snell Apr. 1983 36 p
(Contract W-7405-eng-36)
(DE83-012867; LA-9701-M) Avail: NTIS HC A03/MF A01

U is a controller for running the most often-used utilities on the Ltss 7600 and Ctss Cray computers. Some utilities are run in the normal manner except that abbreviations for the utility name and certain options are allowed. Other utilities are run quite differently, with more specialized but much shorter and more convenient command sequences. Operation of these utilities is described in the manual. U also offers a RUN or R command, which runs any utility or program directly, just as if it were being operated from the user's terminal, and a MON command, which keeps a printed record of any messages sent by a utility or program. DOE

N83-36697# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
WANG LABORATORIES, INCORPORATED VS-100, VS COBOL, VERSION 3.6.3 (PRE-RELEASE) Validation Summary Report
14 Jan. 1983 17 p
(PB83-215210; OSD/FSTC-82/291) Avail: NTIS HC A02/MF A01 CSCL 09B

The FSTC Technical Report for the WANG Laboratories, Inc., VS COBOL, Version 3.6.3 (Pre-Release) running under the OS, Version 05.04.03 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the indexed I-O, Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found, if any. A comparison report Validation Summary Report OSD/FSTC-821/290 provides information regarding the validation of the compiler as the Low Level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-36698# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
WANG LABORATORIES, INCORPORATED VS-100, VS COBOL, VERSION 3.6.3 (PRE-RELEASE) Validation Summary Report
14 Jan. 1983 50 p
(PB83-215202; OSD/FSTC-82/290) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Wang Laboratories, Inc. VS COBOL, Version 3.6.3 (Pre-Release) running under the OS, Version 05.04.03 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36699# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
GOULD, INCORPORATED, SEL COMPUTER SYSTEMS DIVISION, GOULD CONCEPT 32/87, COBOL RELEASE 1.4 Validation Summary Report
27 Dec. 1982 55 p
(PB83-215194; OSD/FSTC-82/265) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the GOULD INC., S.E.L., Computer Systems Division, COBOL Release 1.4 running under the MPX-32 Release 2.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36700# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
GOULD, INCORPORATED, SEL COMPUTER SYSTEMS DIVISION, GOULD CONCEPT 32/87, COBOL RELEASE 1.4 Validation Summary Report
27 Dec. 1982 29 p
(PB83-215186; OSD/FSTC-82/268) Avail: NTIS HC A03/MF A01 CSCL 09B

This FSTC Technical Report for the GOULD INC., SEL COBOL Release 1.4 running under the MPX-32 Release 2.1 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the 21-1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report Validation Summary Report OSD/FSTC-82/265 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-36701# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
MODULAR COMPUTER SYSTEMS MODCOMP CLASSIC II/75, MODCOMP NASA EXTENDED, FORTRAN 78 RELEASE C.0 Validation Summary Report
7 Feb. 1983 19 p
(PB83-215137; OSD/FSTC-83/111) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Modular Computer Sytems, Inc. MODCOMP NASA Extended FORTRAN Release C.O running under the MAX IV Release G.1 provides a

consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.91978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies together with the tests which failed. GRA

N83-36702# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION DECSYSTEM-20 2060 MODEL B, FORTRAN-20 VERSION 7 Validation Summary Report
8 Apr. 1983 17 p
(PB83-215129; OSD/FSTC-83/147) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (USR) for the Digital Equipment Corp. FORTRAN-20 Version 7 running under the TOPS-20 Release 5.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the April 8, 1983 level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies wihin X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36703# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION DECSYSTEM-10 MODEL 1091, FORTRAN-10 VERSION 7 Validation Summary Report
8 Apr. 1983 13 p
(PB83-215079; OSD/FSTC-83/145) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corp. FORTRAN-10 Version 7 running under the TOPS Version 7.01A provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36704# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NATIONAL CSS, INCORPORATED AMDAHL 470 V/8, IBM VS FORTRAN RELEASE 1 Validation Summary Report
7 Jan. 1983 18 p
(PB83-215053; OSD/FSTC-82/256) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the National CSS, Inc. IBM VS FORTRAN Release 1 running under the VP/CSS Release .304 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36705# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEM DPS 8 SERIES: ALL, BASIC INTERPRETER BA2.0 Validation Summary Report
20 Sep. 1982 23 p
(PB83-215046; OSD/FSTC-82/245) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems BA2.0 running under the GCOS SR2000 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36706# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
STRATUS COMPUTER, INCORPORATED STRATUS/32, VOS FORTRAN, RELEASE 2.4A (PRE-RELEASE) Validation Summary Report
4 Mar. 1983 15 p
(PB83-215038; OSD/FSTC-83/100) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Stratus Computer, Inc., VOS FORTRAN, Release 2.4A (Pre-Release) running under the VOS, Release 2.4J provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36707# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION BURROUGHS B-6900, LARGE SYSTEMS COBOL74 Validation Summary Report
6 Dec. 1982 74 p
(PB83-215020; OSD/FSTC-82/300) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (BSR) for the Burroughs Corporation, Large Systems COBOL 74 running under the 111.3. 312 and 111.4 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36708# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HARRIS CORPORATION HARRIS 500, HARRIS FORTRAN 77 (SAU), VERSION 2.2 Validation Summary Report
22 Nov. 1982 24 p
(PB83-215012; OSD/FSTC-82/261) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris Corporation Harris FORTRAN Version 2.2 running under the BOS, Version 2.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies together with the tests which failed. GRA

N83-36709# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NATIONAL CSS, INCORPORATED AMDAHL 470 V/8, IBM 360/370 OS/VS COBOL Validation Summary Report

22 Dec. 1982 51 p
(PB83-215004; OSD/FSTC-82/255) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NATIONAL CSS, INC., IBM 360/370 OS/VS COBOL, Release 2.3 PTF 8 running under the VP/CSS, Release .304 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36710# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
IBM CORPORATION IBM 3081, OS/VS COBOL RELEASE 2.3 Validation Summary Report
28 Jan. 1983 74 p
(PB83-214999; OSD/FSTC-82/320) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) fo the IBM Corporation OS/VS COBOL Release 2.3 running under the MVS/SP Release 1.3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36711# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
GOULD INC., SEL COMPUTER SYSTEMS DIVISION, GOULD CONCEPT 32/87, FORTRAN-77/X32, RELEASE 1.1 Validation Summary Report
27 Dec. 1982 36 p
(PB83-214981; OSD/FSTC-82/267) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the GOULD INC., S.E.L. FORTRAN-77/X32, Release 1.1 running under the MPX-32, Release 3.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36712# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
GOULD INC., SEL COMPUTER SYSTEMS DIVISION, GOULD CONCEPT 32/87, FORTRAN-77+, RELEASE 3.1 Validation Summary Report
27 Dec. 1982 16 p
(PB83-214973; OSD/FSTC-82/266) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Gould Inc., S.E.L. FORTRAN-77+, Release 3.1 running under the MPX-32, Release 2.1 With SRTL, Release 3.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-36713# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS, SERIES 60 LEVEL 68, MULTICS FORTRAN COMPILER, VERSION 10 Validation Summary Report
21 Sep. 1982 28 p
(PB83-214965; OSD/FSTC-82/243) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, MULTICS FORTRAN Compiler Version 10 running under the MULTICS Rel. MR-10.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections, showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36714# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
STRATUS COMPUTER, INCORPORATED STRATUS/32, VOS BASIC RELEASE 2.4 Validation Summary Report
11 Mar. 1983 22 p
(PB83-215921; OSD/FSTC-83/101) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Stratus Computer, Inc. VOS BASIC Compiler Release 2.4 running under the VOS Release 2.4J provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 69). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36715# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
MODULAR COMPUTER SYSTEMS MODCOMP CLASSIC II/75, MODCOMP COBOL 74, A.10 (PRE-RELEASE) Validation Summary Report
7 Feb. 1983 45 p
(PB83-215525; OSD/FSTC-83/110) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Modular Computer Systems, Inc. MODCOMP COBOL 74 A.10 (Pre-Rel.) running under the MAX IV Rel. G.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS 21-1). The compiler was validated against the Low Intermediate level of FIPS PUB21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36273# Hokkaido Univ., Sapporo (Japan).
OPTO-DIGITAL HYBRID PROCESSOR OF ORTHOGONAL TRANSFORM
Tetsuo Shimono, Hideo Kitajima, and Yoshihiko Ogawa *In its* Bu!l. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 73-79 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N83-36716*# Old Dominion Univ., Norfolk, Va. Dept. of Mathematical Sciences.
GRID SPACING CONTROL WITH VARIATION DIMINISHING SPLINES Final Report, 16 Dec. 1982 - 15 Aug. 1983
Phillip W. Smith Oct. 1983 8 p refs
(Contract NAS1-17099)
(NASA-CR-173095; NAS 1.26:173095) Avail: NTIS HC A02/MF A01 CSCL 09B

Methods used to specify and control two and three dimensional grids on which numerical solutions of partial differential equations may be obtained were studied. While initially focusing on grid generation, the research will evolve into a consideration of the interaction of grid generation with the solution of a partial differential equation. The multisurface method of grid generation was used to continuously patch a grid onto an existing grid. In the resulting grid the elements of the Jacobian matrix must be continuous across the boundary between the original grid and the patched grid. Programs were written which accept as input the coordinates of the original grid and the desired new boundary, and then use the three-surface or four-surface version of the multisurface method to extend the original grid out to a new boundary. J.M.S.

N83-36717# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A COMBINED OVER- AND UNDER-ACHIEVEMENT PROGRAMMING APPROACH TO MULTIPLE OBJECTIVES DECISION MAKING
H. R. Weistroffer Feb. 1982 24 p refs
(TWISK-249) Avail: NTIS HC A02/MF A01

An approach is presented to solving multiple criteria decision making problems that can be modelled as a collection of continuous functions that are to be 'maximized'. In this approach, the decision maker specifies for each objective function a minimum required value that must be achieved in order for a solution to be at all acceptable, and a desired value that he would like to be achieved (but which may not be possible to achieve). The required values and desired values thus define a bracket for the actually achievable solution. An interactive technique is proposed in which an efficient solution within the bracket is found and shown to the decision maker at each iteration; on the basis of this solution, the decision maker may then decide to increase some of the required values (perceiving that he can achieve better with respect to the corresponding objectives than he originally thought), and/or decrease some of the desired values (realizing that they are unrealistic) and thus reduce the size of the bracket. An efficient solution within the bracket may be found by simultaneously maximizing the over-achievements with respect to the required values and minimizing the under-achievements with respect to the desired values by making use of barrier functions and penalty functions. A possible algorithm based on these ideas is described and applied to a specific problem. M.G.

N83-36718# National Academy of Sciences - National Research Council, Washington, D. C. National Materials Advisory Board.
MATERIALS PROPERTIES DATA MANAGEMENT: APPROACHES TO A CRITICAL NATIONAL NEED Final Report
Sep. 1983 118 p refs
(Contract MDA903-82-C-0434)
(NMAB-405) Avail: NTIS HC A06/MF A01

Some of the problems associated with the development of materials properties data bases are outlined. The essential features and advantages of a National Computerized Materials Properties Data Bank Network cooperatively established by our federal government and the private sector are described. Such a system would be a positive factor in increasing product reliability and improving the competitive position of the United States in a world market environment where maximum use of advanced technology is decisive for success. Author

N83-36719*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPENDIUM OF UTILITY SOFTWARE AVAILABLE ON THE LEWIS TSS/370 COMPUTER
James J. Pelouch, Jr. Feb. 1982 66 p
(NASA-TM-85425; NAS 1.15:85425) Avail: NTIS HC A04/MF A01 CSCL 09B

Descriptions of software developed for use on the Lewis TSS/370 System are presented. The software items were developed to allow the TSS/370 to assist in the accomplishment of management and administrative tasks such as status reporting, preparing presentations, and performing analyses. The software employs the TSS Graphics Package and its peripherals, and the IBM380 printer. Special stroke and font tables have been developed and are used to drive these hardware devices to produce unique output such as large characters, special style characters, and characters that are rotated sideways. Author

N83-36720# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Sciences.
SOFTWARE DEVELOPMENT PROJECTS: ESTIMATION OF COST AND EFFORT (A MANAGERS DIGEST) M.S. Thesis
Charles James Pierce and Rebecca Louise Wagner Dec. 1982 103 p refs
(AD-A126358) Avail: NTIS HC A06/MF A01 CSCL 09/2

This research focuses on the principles upon which models have been, and may be, constructed for estimating cost and effort in software development projects. A definition of and factors influencing software engineering economics is presented. The major phases and activities of the software lifecycle are described. Effort, time and cost estimation is analyzed. A presentation is then given of some widely used models for estimating cost and effort. Critical factors which must be considered when constructing a model for estimating cost and effort in software development projects are then presented. The authors summarize by citing areas that require more attention if cost and effort estimates are to be further improved. Author

N83-36721# Office of Naval Research, London (England).
NATO/AGARD SYMPOSIUM ON SOFTWARE FOR AVIONICS
David Weiss 26 Apr. 1983 9 p Symp. held in Kijkduin, Netherlands, 1982
(AD-A130693; ONR-C-7-83) Avail: NTIS HC A02/MF A01 CSCL 09/2

The symposium was concerned with requirements, design, development, verification, and validation of avionics software. A few papers concerned research results and future technology, but most dealt with the practical aspects of software development. The avionics community is struggling to automate its work. Different methodologies are being used to impose discipline on avionics software development, and the methodology developers are now attempting to provide as much automated support as possible. Support tools such as requirement specification systems, high level language compilers, data-base systems, test languages, and other test tools are all being slowly integrated into the software development process. The situation can be contrasted with that 10 years ago, when software developers were thinking about what methodology to use. Perhaps most ignored during the symposium were techniques for design - as opposed to techniques for managing development. The criteria used to organize and document a design are the basic problems in producing systems that are maintainable over long periods of time. GRA

N83-36722# University of Southern California, Marina del Rey. Information Sciences Inst.
THREE DIMENSIONS OF DESIGN DEVELOPMENT
Neil M. Goldman Jul. 1982 14 p refs
(Contract MDA903-81-C-0335)
(AD-A130588; ISI/RS-83-2) Avail: NTIS HC A02/MF A01 CSCL 09/2

Formal specifications are difficult to understand for a number of reasons. When the developer of a large specification explains it to another person, he typically includes information in his explanation that is not present, even implicitly, in the specification itself. One useful form of information presents the specification in terms of an evolution from simpler specifications. Typically a specification was actually produced by a series of evolutionary steps reflected in the explanation. This paper suggests three dimensions of evolution that can be used to structure specification developments: structural granularity, temporal granularity, and coverage. Their use in a particular example is demonstrated.
Author (GRA)

N83-36723# University of Southern California, Marina del Rey. Information Sciences Inst.
TOOLS FOR TESTING DENOTATIONAL SEMANTIC DEFINITIONS OF PROGRAMMING LANGUAGES
Vittal Kini, David F. Martin, and Allen Stoughton May 1983 82 p refs
(Contract MDA903-81-C-0335)
(AD-A129818; ISI/RR-83-112) Avail: NTIS HC A05/MF A01 CSCL 09/2

A denotational formal sematic defintion (FSD) of the Ada programming language was developed at the Institut National de Recherche en Informatique et en Automatique (INRIA), in France. Its intent is to provide the precise meaning of the language and its constructs via the mathematical formalism which underlies the denotationa semantic descriptive technique. Due to the complexity, it is difficult for a person to understand the definition or to attempt symbolic execution of the definition without machine assistance. This report describes the work of the ISI Formal Sematics project in developing and constructing tools to aid the understanding and validation of the ADA FSD. First we briefly describe the INRIA meta-language, AFDL, and the extensions we were forced to make to it. Next we describe the various tools we have built and their application to the interpreting of the FSD. Finally, we describe the outcome of the project. The appendices contain an informal specification of our enhanced version of AFDL (AFDL +), a definition of the toy programming lanuage TINY in ADFL +, and a transcript of an example use of our tools to process TINY definition. GRA

N83-36724# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
A DIAGNOSIS ALGORITHM FOR THE BGM (BARSI, GRANDONI AND MAESTRINI) SYSTEM LEVEL FAULT MODEL
Gerard G. L. Meyer 15 Jun. 1983 12 p refs
(Contract N00014-80-C-0772)
(AD-A129786; JHU/EECS-83/06) Avail: NTIS HC A02/MF A01 CSCL 12/1

A tau-diagnosable system is a system in which all faults may be identified from the test results, provided that the number of faults does not exceed tau. In this paper we present an algorithm that may be used for the diagnosis of the system level BGM fault model proposed by Barsi, Grandoni and Maestrini, whenever the system is tau-diagnosable and the number of faults is at most tau. Author (GRA)

N83-36725# Dayton Univ., Ohio.
MAGNA (MATERIALLY AND GEOMETRICALLY NONLINEAR ANALYSIS). PART 3: POSTPROCESSOR MANUAL Final Report, Mar. 1980 - Dec. 1982
Robert A. Brockman, T. S. Bruner, M. J. Hecht, M. P. Bouchard, and M. E. Wright Wright-Patterson AFB, Ohio AFWAL Dec. 1982 105 p
(Contract F33615-80-C-3403; AF Proj. 2402)
(AD-A129222; UDR-TR-82-113; AFWAL-TR-82-3098-Pt-3) Avail: NTIS HC A06/MF A01 CSCL 09/2

Three computer graphics programs, designed to present the results of finite element structural analysis in a readily assimilated form, are described. The first, GPLOT, performs plotting of original and/or deformed mesh geometries. A second program, CPLOT, produces contour or relief maps of displacement, strain, or stress results. These two programs are command-driven and offer a wide variety of display options. The third program, XYPLOT, generates variable-versus-variable plots with user-defined labeling, symbols, titling, and plot size. The graphics programs are operational with Tektronix and Hewlett-Packard display devices, on CDC and VAX machines. GRA

N83-36726# Corps of Engineers, St. Paul, Minn.
PROJECT SCHEDULING USING CRITICAL PATH METHOD AND CHARTING TECHNIQUES FOR HARRIS COMPUTERS (CPM) CRITICAL PATH METHOD. USER'S MANUAL
Douglas D. Gransberg and Robert C. Stackowiak 9 May 1983 69 p refs
(AD-A129688) Avail: NTIS HC A04/MF A01 CSCL 09/2

The user's manual is designed for the CPM system to provide non-ADP personnel with the information necessary to use the system effectively. A brief overview of critical path method (CPM) theory is provided, and illustrates the computations made by the program. The purpose of the program is to perform CPM calculations and provide an automated system for integrated multiple project scheduling and resource evaluation. Author (GRA)

N83-36727# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
AN EFFICIENT PROGRAM FOR MANY-BODY SIMULATIONS (OR, CRAY PERFORMANCE FROM A VAX) Interim Report
Andrew W. Appel Mar. 1983 26 p refs
(Contract N00014-76-C-0370)
(AD-A129676; CMU-CS-83-118) Avail: NTIS HC A03/MF A01 CSCL 09/2

The simulation of N particles interacting in a gravitational force field is useful in astrophysics, but such simulations become costly for large N. Representing the universe as a tree structure with the particles at the leaves and internal nodes labelled with the centers of mass of their descendants allows several simultaneous attacks on the computation time required by the problem. These approaches range from algorithmic changes (replacing an O(N2) algorithm with an O(N log N) algorithm) to data structure modifications, code-tuning, and hardware modifications. The changes reduced the running time of a large problem (N = 10,000) by a factor of four hundred. This paper describes both the particular program and the methodology underlying such speedups. GRA

N83-36728# RAND Corp., Santa Monica, Calif.
FAST CONCURRENT SIMULATION USING THE TIME WARP MECHANISM. PART 1: LOCAL CONTROL Interim Report
David Jefferson (Univ. of Southern California) and Henry Sowizral Dec. 1982 68 p refs
(Contract F49620-82-C-0018)
(AD-A129431; RAND/N-1906-AF) Avail: NTIS HC A04/MF A01 CSCL 09/2

More than 20 years after its development, computer simulation continues to be a time-consuming process. This Note addresses the problem of speeding up simulation through concurrency. The authors propose a new method for concurrent simulation. The Note first presents the fundamental issues in concurrent discrete event simulation. A critical analysis of the methods for concurrent simulation proposed in the literature follows. Then the authors give a detailed description of the local control part of the Time Warp mechanism, the part concerned with the actual mechanics of discrete event simulation. Finally, the discussion examines the concepts of messages, antimessages, annihilation, and rollback.
GRA

N83-36729# Analytic Sciences Corp., Reading, Mass.
THE WEAPONS SUPPORT SYSTEM MULTISENSOR SIMULATION SOFTWARE PROGRAM DOCUMENTATION
Charles L. Ayres, Jacob D. Goldstein, and James R. Staudinger 1 Oct. 1981 166 p refs
(Contract F19628-80-C-0078; AF Proj. 3204)
(AD-A129401; AFGL-TR-81-0307; TASC-J-1946; SR-4) Avail: NTIS HC A08/MF A01 CSCL 09/2

The multisensor simulation software is designed to analyze

the effects of multisensor surveys of the gravity field on gravimetric estimation errors and weapon system performance. The analysis methodology on which this soft-ware is based was developed by TASC for the Air Force Geophysics Laboratory and the Defense Mapping Agency. The program is ideally suited for the design of multisensor surveys to achieve a desired level of accuracy in gravity recovery or weapon system performance. Author (GRA)

N83-36730# Arizona State Univ., Tempe. Group for Computer Studies of Strategies.
ON AUTOMATIC GENERATION OF DESCRIPTIVE AND NORMATIVE THEORIES
Nicholas V. Findler Mar. 1983 5 p
(Grant AF-AFOSR-0340-82; AF Proj. 2304)
(AD-A129396; AFOSR-83-0486TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper discusses a large-scale programming system, the Quasi-Optimizer (QO), that has four major objectives: (1) to observe and measure adversaries' behavior in a competitive environment, to infer their strategies and to construct a computer model, a descriptive theory, of each; (2) to identify strategy components, evaluate their effectiveness and to select the most satisfactory ones from a set of computed descriptive theories; (3) to combine these components in a quasi-optimum strategy that represents a normative theory in the statistical sense; and (4) to provide information as to in which regions a given strategy is most proficient, to a meta-strategy. It will then shift the domain of confrontations between the strategy and its adversaries to the regions specified and, thereby, increase the effective quality of the strategy.
Author (GRA)

N83-36731# Maryland Univ., College Park. Inst. for Physical Science and Technology.
FEASIBILITY OF APPLYING THE FINITE ELEMENT ADAPTIVE RESEARCH SOLVER (FEARS) PROGRAM TO THE PLATE BENDING PROBLEM
Donald A. Gignac (Taylor Naval Ship R&D Center) and Ivo Babuska Bethesda, Md. Naval Ship Research and Development Center May 1983 25 p refs
(Contract N00167-82-M-0743; ZR0140201)
(AD-A129395; DTNSRDC/CMLD-83/11) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report documents an investigation of the feasibility of the application of the Finite Element Adaptive Research Solver (FEARS) computer program to the Plate Bending Problem. Two methods of reducing this biharmonic problem to an elliptic system of two second order partial differential equations are considered. The first is the splitting method and the second is the transformation to the Lame system of elasticity equations. The FEARS program is used to solve these reduced systems for three examples. The results are analyzed and discussed withregard to the computation of displacements, moment, and shear forces. While the Lame' system approach is well-founded theoretically, it poses some computational problems with regard to accuracy. The authors feel that the splitting method when monitored by error indicators is the preferred method for FEARS users even though; the theory of this method has not been completely developed yet.
Author (GRA)

N83-36732# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
ONE-STEP DIAGNOSIS ALGORITHMS FOR THE BGM (BARSI, GRANDONI AND MAESTRINI) SYSTEM LEVEL FAULT MODEL
Gerard G. L. Meyer 15 Dec. 1982 19 p refs
(Contract N00014-80-C-0772)
(AD-A129384; JHU/EECS-82/14) Avail: NTIS HC A02/MF A01 CSCL 12/1

A one-step tau-fault diagnosable system is a system in which all faults may be identified from the test results, provided that the number of faults does not exceed tau. In this paper we present two algorithms that may be used for the one-step diagnosability of the system level fault model proposed by (Barsi, Grandoni and Maestrini.) The first algorithm may be used when the system is one-step tau-fault diagnosable and no two units test each other, and the second algorithm may be used whenever the system is one-step tau-fault diagnosable. Author (GRA)

N83-36733# Illinois Univ., Urbana. Dept. of Computer Science.
STIFF SOFTWARE: WHAT DO WE HAVE AND WHAT DO WE NEED?
C. W. Gear Nov. 1982 38 p refs
(Contract DE-AC02-76ER-02383)
(DE83-011056; UIUCDCS-R-82-1109; UILU-ENG-82-1736; COO-2383-0088) Avail: NTIS HC A03/MF A01

Software for stiff differential equations is surveyed. The classical stiff problem is well-served by existing software and some codes are appearing for some of the other areas, particularly problems with eigenvalues near the imaginary axis. A number of other difficulties are identified and the state of and possibilities for software development in these areas are discussed. DOE

N83-36734# Los Alamos Scientific Lab., N. Mex.
Q-MEMORY RESIDENT HISTOGRAMMING SYSTEM
Michael A. Oothoudt, James F. Amann, Richard A. Floyd, James F. Harrison, and Thomas Kozlowski 1983 5 p refs Presented at the IEEE Natl. Computer Conf., Anaheim, Calif., 16-19 May 1983
(Contract W-7405-eng-36)
(DE83-012674; LA-UR-83-1370; CONF-830501-6) Avail: NTIS HC A02/MF A01

The LAMPF Data-Acquisition System Q includes a subsystem to allow the user to create, delete, enter data in, and retrieve data from histograms stored in memory. The system is implemented on PDP-11 computers RSX-11M V4.0 as an I/O driver with user-callable subroutines interfacing to the driver. A system with an identical user interface will soon be available on VAX computers under VMS V3.2. DOE

N83-36735# Los Alamos Scientific Lab., N. Mex.
DRAFT: A SIMPLE DRAFTING PROGRAM FOR X-Y PLOTS
Charles Snell and William Peter Mar. 1983 25 p refs
(Contract W-7405-eng-36)
(DE83-013318; LA-9733-M) Avail: NTIS HC A02/MF A01

DRAFT is a CTSS/LTSS program that draws publication-quality plots of ordered x-y data or analytic functions supplied by the user. Input may be provided interactively or from a disk file. The salient characteristics of the program are ease of use and simple format-free input. The graphics capabilities in DRAFT are somewhat limited since it can plot only x-y curves or sets of symbols. However, the user can exercise considerable control over scales, labels, and othe features of the plots. The code can retain up to 25 data sets at a time, allowing the user to overplot various curves or to repeatedly redraw curves with the scales and other features modified as desired. DOE

N83-36736# California Univ., Livermore. Lawrence Livermore Lab. Methods Development Group.
THEORETICAL MANUAL FOR DYNA3D
John O. Hallquist Mar. 1983 81 p refs
(Contract W-7405-eng-48)
(DE83-011209; UCID-19401) Avail: NTIS HC A05/MF A01

This report provides a theoretical manual for DYNA3D, a vectorized explicit three dimensional finite element code for analyzing the large deformation dynamic response of inelastic solids. A contact impact algorithm that permits gaps and sliding along material interfaces is described. By a specialization of this algorithm, such interfaces can be rigidly tied to admit variable zoning without the need of transition regions. Spatial discretization is achieved by the use of 8 node solid elements, and the equations of motion are integrated by the central difference method. DYNA3D is operational on the CRAY-1 and CDC7600 computers. DOE

N83-36737# Oak Ridge Y-12 Plant, Tenn. Physical Testing Dept.
PROCEDURE FOR COMMUNICATIONS WITH PDP-10 AND PDP-11 (IS/1 UNIX) TYPE COMPUTERS THROUGH USE OF

THE CPT-8000/8100 WORD PROCESSOR
C. A. Reeves, Jr. 27 Jun. 1983 61 p refs
(Contract W-7405-eng-26)
(DE83-014538; Y/DL-759) Avail: NTIS HC A04/MF A01

A detailed procedure is given for communications between CPT 8000 and 8100 Word Processors and Digital Equipment Corporation PDP-type computers. These include the PDP-10, PDP-11, and VAX-series computers. This procedure is presented both to assist and to give guidelines for such communications, and to aid persons with similar types or equipment, perhaps of other manufacturers, in their endeavors. DOE

N83-36738# California Univ., Livermore. Lawrence Livermore Lab.
PLOTTING CV DRAWINGS ON AN ELECTRON-BEAM RECORDER
Donald L. Vickers 21 Jun. 1983 11 p Presented at the 5th Ann. Intern. Computervision User Conf., Miami, Fla., 13-16 Sep. 1983
(Contract W-7405-eng-48)
(DE83-014839; UCRL-89383; CONF-8309111-2) Avail: NTIS HC A02/MF A01

A new, ultrahigh quality film output device was interfaced to an array of computer vision systems. The device, an electron beam recorder (EBR) made by Image Graphics Incorporated, allows an engineering drawing to be achieved directly on 4 x 6 inch film without going first to paper. EBR technology of this quality and speed is relatively new and produces extremely good quality drawings. Film, placed inside a vacuum, is exposed directly by a computer controlled beam of electrons which can draw a line as narrow as .00025 inch. Addressability on the film is an impressive 48K x 64K. EBR stored graphic arts fonts and symbols give a professional, typeset look to a drawing without the cost of transmitting the high quality CV fonts. DOE

N83-36739# Stanford Univ., Calif. Lab. for Systems Optimizations.
ADVANCES IN A NESTED DECOMPOSITION ALGORITHM FOR SOLVING STAIRCASE LINEAR PROGRAMS
Robert James Wittrock Mar. 1983 119 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; Grants NSF MCS-81-19774; NSF MCS-79-26009; NSF MCS-80-12974; NR Proj. 047-143)
(DE83-011188; DOE/ER-72018/T8; SU-SOL-83-2) Avail: NTIS HC A06/MF A01

A staircase linear program is a linear program in which the variables can be partitioned into a set of time periods, with constraints only between adjacent periods. Staircase LPs usually arise in models of economic or industrial planning over time. This report presents a special technique for solving these LPs, which is classified as a nested decomposition approach. This technique applies the Dantzig-Wolfe decomposition prnciple to the dual of the LP in a recursive manner. The resulting algorithm solves a sequence of small LPs, one corresponding to each period. After being optimized, a given period passes primal information to the period that follows it and dual information to the period that precedes it. In this way, each period is modified and re-optimized several times, until its optimal solution converges to the optimal solution to the full staircase LP. The primary focus of this report is on two major improvements to this basic technique. The first improvement allows each period to pass much more primal information to the period following it. The second improvement allows each period to pass much more dual information to the period preceding it. Initial computational experience has shown that these improvements accelerate convergence, in that considerably fewer period optimization have to be performed. DOE

N83-36740# Oak Ridge National Lab., Tenn.
RIP: GENERAL-PURPOSE INTERACTIVE DISPLAY AT HHIRF
R. O. Sayer 16 May 1983 5 p refs Presented at the Real-time Computer Appl. in Nucl. and Particle Phys. Conf., Berkeley, Calif., 16 May 1983
(Contract W-7405-eng-26)
(DE83-014049; CONF-830576-5) Avail: NTIS HC A02/MF A01

RIP is a general-purpose interactive code for display and analysis of data acquired with the Holifield Heavy Ion Research Facility (HHIRF) accelerators at Oak Ridge National Laboratory. The HHIRF data-acquisition system includes a version of RIP for on-line display of one and two dimensional histograms on color graphic terminals and hard copy on color printer/plotters. General features of the program and interactive techniques will be described. DOE

N83-36741# California Univ., Livermore. Lawrence Livermore Lab.
ODE SOLVERS FOR TIME-DEPENDENT PDE SOFTWARE
Alan C. Hindmarsh Jun. 1983 16 p refs Presented at the IFIP PDE Software Conf., Soderkoping, Sweden, 22-26 Aug. 1983
(Contract W-7405-eng-48)
(DE83-013335; UCRL-89311; CONF-830873-1) Avail: NTIS HC A02/MF A01

It is possible to list many of the features that are desirable or essential in ODE solvers that are to be used in the automated solution of time-dependent PDE systems. Many ODE solvers available today, including those in the ODEPACK collection, have been designed with just such features in mind. But they do not meet the demand completely, by any means. Some desired capabilities, including various sparsity structures, have not yet been included. Or it may be that individual capabilities of interest each appear in one or more solvers, but not all in a single solver. Greater interchangeability of modules would be helful. With continued efforts in the development and use of modern algebraic system solvers and in modular software design, ODE solvers should continue to come closer to meeting the needs of PDE software. DOE

N83-36742# Hanford Engineering Development Lab., Richland, Wash.
GUIDELINES: SOFTWARE CONFIGURATION MANAGEMENT
N. P. Wilburn, R. B. Doggett (BCS Richland, Inc.), and Z. E. Carey (BCS Richland, Inc.) Jan. 1983 75 p refs
(Contract DE-AC06-76FF-02170)
(DE83-014756; HEDL-TC-2263) Avail: NTIS HC A04/MF A01

A guideline is given for Software Configuration Management during a software life cycle. Each of the different functions of SCM is discussed as well as its relationship to overall project management. DOE

N83-36743# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
C3, INCORPORATED, C50 PERKIN-ELMER 3250, C3 COBOL-75, VERSION 1.50 Validation Summary Report
23 Mar. 1983 75 p
(PB83-221283; OSD/FSTC-83/160) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the C3, Incorporated, C3 COBOL-75 Version 1.50 running under the Perkin-Elmer OS/32 Version 6.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21.1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36744# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
MOHAWK DATA SCIENCES, MDS COBOL RELEASE 13 ANSI 74 SERIES 21, SYSTEM 2100 OPERATING SYSTEM OS/2 Validation Summary Report
22 Feb. 1983 53 p
(PB83-221275; OSD/FSTC-82/165) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Mohawk Data

Sciences, MDS COBOL Release 13 ANSI 74 running under the OS/2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36745# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
APPLE COMPUTER, INCORPORATED, APPLE /// FORTRAN VERSION 1.0 (PRE-RELEASE) Validation Summary Report
28 Mar. 1983 18 p
(PB83-221267; OSD/FSTC-82/225) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Apple Computer Inc., Apple 3 FORTRAN Version 1.0 Pre-release running under the SOS (Sophisticated Operating System) Version 1.31X provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36746# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NCR CORPORATION NCR V8570, VRX COBOL 37 Validation Summary Report
11 Jun. 1983 57 p
(PB83-221259; OSD/FSTC-82/315) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NCR Corporation, VRX COBOL 37 running under the VRX Release 9 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36747# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CONTROL DATA CORPORATION CYBER 170-835, FORTRAN 5 LEVEL 587 Validation Summary Report
11 Apr. 1983 14 p
(PB83-221242; OSD/FSTC-83/135) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Control Data Corporation, FORTRAN 5 Level 587 running under the NOS 2.1 Level 580 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies with the tests which failed. GRA

N83-36748# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION VAX 11/780, VAX-FORTRAN V3.2 Validation Summary Report
9 May 1983 13 p
(PB83-221234; OSD/FSTC-83/204) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corp., VAX-FORTRAN Version 3.2 running under the VAX/VMS Version 3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include a overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36749# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
PRIME COMPUTER, INCORPORATED PRIME 750, COBOL-74, REVISED 18.3 (PRE-RELEASED) Validation Summary Report
24 Jan. 1983 53 p
(PB83-215319; OSD/FSTC-82/295) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Prime Computer, Inc. COBOL 74 Rev. 18.3 (Pre-rel.) running under the Primos Rev. 18.3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36750# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION LSI 11/23, MINC BASIC, VERSION 3.0 Validation Summary Report
18 Mar. 1983 16 p
(PB83-215301; OSD/FSTC-83/115) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corp. NINC BASIC Interpreter Version 3.0 running under the RT11, Version 3B provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIBS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36751# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
SOFTWARE IMPROVEMENT: A NEEDED PROCESS IN THE FEDERAL GOVERNMENT Validation Summary Report
3 Jun. 1981 19 p
(PB83-215293; OSD/FSTC-81/102) Avail: NTIS HC A02/MF A01 CSCL 09B

An overview of the trends in ADP is presented, addressing primarily the importance of software, the software problems that exist at most government ADP organizations, and the causative factors for those software problems. It discusses the need for software modernization and improvement, and builds a strong case for the need for a 'software improvement program' (SIP), especially in the federal government. It presents a viable incremental and evolutionary approach to resolving the existing software problems and improving the existing software, rather than the more conventional, but extreme, tear-it-down-and-start-over-again or don't-touch-it-or-it-will-collapse philosophies. GRA

N83-36752# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NCR CORPORATION NCR 8570, VRX FORTRAN, VERSION 23 Validation Summary Report
11 Jan. 1983 16 p
(PB83-215285; OSD/FSTC-82/316) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NCR Corporation VRX FORTRAN, Version 23 running under the VRX Release 9 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36753# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NECIS, INCORPORATED ASTRA 270-200, COBOL 74 RELEASE 6.2A Validation Summary Report
8 Apr. 1983 13 p
(PB83-215236; OSD/FSTC-83/151) Avail: NTIS HC A02/MF A01 CSCL 09B

This FSTC Technical Report for the NEC Information Systems, Inc. COBOL 74 Release 6.2A running under the ASTRA OS Release 6.23 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found-if any. A companion report Validation Summary Report OSD/FSTC-83/150 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-36754# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NECIS, INCORPORATED ASTRA 270-200, COBOL 74 REVISION 6.2A Validation Summary Report
8 Oct. 1983 55 p
(PB83-215228; OSD/FSTC-83/150) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NEC Information Systems, Inc. COBOL 74 Release 6.2A running under the ASTRA/OS Release 6.23 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21.1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36755# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
CONTROL DATA CORPORATION CYBER 170-835, BASIC3 LEVEL 587 Validation Summary Report
18 Apr. 1983 16 p
(PB83-221226; OSD/FSTC-83/136; FIPS-PUB-68) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Control Data Corporation, BASIC3 Level 587 running under the NOS 2.1 Level 580 provides a consolidated summary of the results obtained from the validation of the subject compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-36756# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION. BURROUGHS B-6900, LARGE SYSTEMS BASIC VERSION III.4 Validation Summary Report
8 Dec. 1982 29 p
(PB83-220715; OSD/FSTC-82/302) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Burroughs Corporation, Large Systems BASIC Version III.4 running under the III.3.312 and III.4 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36757# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
NCR CORPORATION NCR V8570, VRX COBOL 37
11 Jan. 1983 30 p
(PB83-216572; OSD/FSTC-82/317) Avail: NTIS HC A03/MF A01 CSCL 09B

This FSTC Technical Report for the NCR Corporation VRX COBOL Version 37 running under the VRX Release 9 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Nucleus, Level 2; Table Handling, Level 2; Sequential I-O, Level 2; Relative I-O, Level 2; Indexed I-O, Levels 1 & 2; Sort-Merge, Levels 1 & 2; Segmentation, Level 2 library, Level 2; Debug, Level 2; Inter-Prog. Comm., Level 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report Validation Summary Report OSD/FSTC-82/315 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-36758# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
PRIME COMPUTER, INCORPORATED PRIME 750, COBOL-74, REVISED 18.3 (PRE-RELEASED) Validation Summary Report
24 Jan. 1983 57 p
(PB83-216564; OSD/FSTC-82/295) Avail: NTIS HC A04/MF A01 CSCL 09B

The purpose of the Validation Summary Report (VSR) is to identify individual COBOL language elements of the American National Standard Programming Language COBOL, X3.23-1974 (ANS COBOL) in which the vendor's implementation does not conform to that standard and to Federal Standard COBOL as adopted from the American National Standard by Federal Information Processing Standard 21-1 (FIPS PUB 21-1). The VRX Cobol 3.7 compiler was evaluated. GRA

N83-36759# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION PDP 11/60, PDP-11 FORTRAN-77 VERSION 4.1 Validation Summary Report
18 Jan. 1983 13 p
(PB83-215897; OSD/FSTC-82/305) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corporation PDP-11 FORTRAN-77 V4.1 running under the RSX-11M V4.0 provides a consolidated summary of the results obtained from the validation of the subject complier against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subsert FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36760# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION BURROUGHS B-6900, FORTRAN 77 VERSION III.4 Validation Summary Report
7 Dec. 1982 16 p
(PB83-215368; OSD/FSTC-82/301) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Burroughs Corporation Large Systems FORTRAN 77 Version III.4 running under the III.3.312 and III.4 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36761# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HARRIS CORPORATION HARRIS 500, HARRIS FORTRAN 77 (NON-SAU) VERSION 2.2 Validation Summary Report
22 Nov. 1982 20 p
(PB83-215350; OSD/FSTC-82/262) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris Corporation Harris FORTRAN (NON-SAU) Version 2.2 running under the VOS, Version 2.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36762# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS LEVEL 6 MODEL 47, BASIC INTERPRETER REL. 3.0 Validation Summary Report
15 Oct. 1982 17 p
(PB83-215343; OSD/FSTC-82/201) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, BASIC Interpreter Rel.3.0 running under the MOD 400 Rel. 3.0 provides a consolidated summary of the results obtained the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36763# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION DECSYSTEM-20, MODEL 2020, FORTRAN-20 VERSION 7 Validation Summary Report
8 Apr. 1983 13 p
(PB83-215335; OSD/FSTC-83/146) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corp. FORTRAN-20 Version 7 running under the TOPS-20 Release 4.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB69). The compiler was validated against the April 8, 1983 level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36764# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
PRIME COMPUTER, INCORPORATED PRIME 750, FORTRAN-77, REVISED 19.2 (PRE-RELEASED) Validation Summary Report
24 Jan. 1983 24 p
(PB83-215327; OSD/FSTC-82/296) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Prime Computer, Inc. FORTRAN-77 Rev. 19.2 (Pre-rel.) running under the PTIMOS Rev. 19.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-36765# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
SOFTWARE CONVERSION LESSONS LEARNED Final Report
Jan. 1983 69 p Sponsored in part by GSA
(PB83-210906; OSD/FCSC-83/003) Avail: NTIS HC A04/MF A01 CSCL 09B

This report provides case studies of Government agencies and private companies who have recently converted major ADP software systems. Four detailed case studies of conversion projects are reviewed. Each case study analyzes the experience and knowledge gained during the four phases of conversion: Planning, Preparation, Translation, and Implementation. A summary chapter highlights the lessons learned and provides items to be taken into consideration in planning a software conversion project. GRA

N83-36091*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
ALGORITHMS FOR ESTIMATION IN DISTRIBUTED MODELS WITH APPLICATIONS TO LARGE SPACE STRUCTURES
H. T. Banks *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 505-509 refs (For primary document see N83-36061 24-18)
(Grant NAG1-258; Contract DAAG29-79-C-0161; Grant AF-AFOSR-0198-81)
Avail: NTIS HC A99/MF A01 CSCL 09B

N83-36272# Hokkaido Univ., Sapporo (Japan).
QUANTIZED IMAGE RESTORATION CONSIDERING THE CORRELATION BETWEEN PIXELS
Nobuyuki Okamoto, Hideo Kitajima, Tetsuo Shimono, and Yoshihiko Ogawa *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 65-72 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N83-36766# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
STUDY OF A HETEROGENEOUS DISTRIBUTED MICROCOMPUTER NETWORK USING MEASURED DATA AND ANALYTIC/SIMULATION MODELS Final Report, 10 Jun. 1980 - 8 Sep. 1982
Joe L. Hammond and Jay H. Schlag Mar. 1983 76 p refs
(Contract DAAG29-80-K-0009; DA Proj. SX7-62725-DY-10)
(AD-A128719; E21-616) Avail: NTIS HC A05/MF A01 CSCL 09/2

The objective of this project, initiated by the U.S. Army Institute for Research in Management Information and Computer Science was to develop a cost-effective alternative to discrete-event simulation methods for studying carrier sense multiple access

networks. This report contains sections on the design, conceptual approach, and implementation of the CSMA emulation facility and preliminary experiments performed to validate it. Author (GRA)

N83-36767# Kestrel Inst., Palo Alto, Calif.
RESEARCH ON SYNTHESIS OF CONCURRENT COMPUTING SYSTEMS Final Technical Report, 2 Oct. 1981 - 30 Sep. 1982
Richard M. King, Thomas C. Brown, and Cordell Green Sep. 1982 45 p refs
(Contract F49620-82-C-0007; AF Proj. 2304)
(AD-A130048; AFOSR-83-0562TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

The object of our research is the codification of programming knowledge for the synthesis of concurrent programs. This final report presents the derivation of two concurrent algorithms: dynamic programming (for the class of problems that run in polynomial time on sequential machines) and array multiplication. Both derived concurrent versions run in linear time. The concurrent versions are significant and complex algorithms, though they are not new and already have been reported in the literature. The synthesis knowledge for these derivations is embodied in seven synthesis rules, preliminary versions of which are presented in this report. The rules will probably generalize to other classes of algorithms but we have not explored that issue yet. We have also discovered a pair of techniques called virtualization and aggregation. This pair of techniques (plus the other seven rules) is shown to be powerful enough to synthesize Kung's systolic array architecture (Kung-76) from a specification of matrix multiplication. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N83-36768# Wright State Univ., Dayton, Ohio. Dept. of Mathematics and Statistics.
AN OUTPUT MATCHING APPROACH TO MULTIVARIABLE LINEAR DIGITAL CONTROL Final Scientific Report, 1 Jun. - 31 Aug. 1982
David F. Miller 30 Nov. 1982 9 p refs
(Grant AF-AFOSR-0208-82; AF Proj. 2304)
(AD-A128662; AFOSR-83-0400TR; REPT-0001) Avail: NTIS HC A02/MF A01 CSCL 14/2

A simple and direct state space approach to the digital control of multivariable linear system is discussed. Control is provided by minimizing the mean square error between controlled plant outputs and specified desired output trajectories at sampling instants. Systems of linear equations for digital control inputs result with solutions assuming a natural constant forward and feedback gain form. Optimal gains are determined using elementary results form linear systems theory and standard techniques from linear algebra. Numerical applications to examples in simple model following, digital redesign, and direct digital design are described. Partial state observability and the effects of sampling rate upon system performance are considered. Control smoothing through matching at multiple sampling instants is discussed. This strategy provides improved performance without additional computational expense or increased sampling rate. Author (GRA)

N83-36769# Army Topographic Command, Washington, D. C.
THE ARMY'S ACTIVITIES IN ARTIFICIAL INTELLIGENCE/ROBOTICS
Robert D. Leighty 27 Aug. 1982 13 p refs
(AD-A130128; ETL-R042) Avail: NTIS HC A02/MF A01 CSCL 06/4

A historical summary of the Army activities in artificial intelligence and robotics (AI/R) in the last one and one-half years indicates Army interest in AI/R from the laboratories to the Secretariat. Numerous funded and unfunded efforts are now planned by the laboratories even though AI/R technologies lack maturity necessary for autonomous battlefield systems in the 1990's. The potential applications of AI/R systems to Army needs appear to be limitless. DARCOM and TRADOC have prioritized AI/R requirements and plans for five high priority Demonstrators have been prepared. These demonstrators reflect the need to get started with today's technologies. Technological enhancements provided by additional research and development can provide additional autonomy in product improvement phases of the system development cycle. Author (GRA)

N83-36770*# National Bureau of Standards, Washington, D.C. National Engineering Lab.
AN OVERVIEW OF ARTIFICIAL INTELLIGENCE AND ROBOTICS. VOLUME 2: ROBOTICS
William B. Gevarter Mar. 1982 103 p refs
(NASA-CR-173135; NAS 1.26:173135; PB83-217457; NBSIR-82-2479-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 09B

This report provides an overview of the rapidly changing field of robotics. The report incorporates definitions of the various types of robots, a summary of the basic concepts, utilized in each of the many technical areas, review of the state of the art and statistics of robot manufacture and usage. Particular attention is paid to the status of robot development, the organizations involved, their activities, and their funding. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N83-36771*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEW DISCRETIZATION AND SOLUTION TECHNIQUES FOR INCOMPRESSIBLE VISCOUS FLOW PROBLEMS Final Report
M. D. Gunzburger, R. A. Nicolaides, and C. H. Liu Aug. 1983 22 p refs
(Contract NAS1-17130)
(NASA-CR-172196; ICASE-83-44; NAS 1.26:172196) Avail: NTIS HC A02/MF A01 CSCL 12A

Several topics arising in the finite element solution of the incompressible Navier-Stokes equations are considered. Specifically, the question of choosing finite element velocity/pressure spaces is addressed, particularly from the viewpoint of achieving stable discretizations leading to convergent pressure approximations. The role of artificial viscosity in viscous flow calculations is studied, emphasizing work by several researchers for the anisotropic case. The last section treats the problem of solving the nonlinear systems of equations which arise from the discretization. Time marching methods and classical iterative techniques, as well as some modifications are mentioned. M.G.

N83-36772*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTATIONAL METHODS FOR ESTIMATION OF PARAMETERS IN HYPERBOLIC SYSTEMS
H. T. Banks (Brown Univ.), K. Ito, and K. A. Murphy (Brown Univ.) Sep. 1983 16 p refs
(Contracts NAS1-15810; NAS1-16394; NAS1-17070; NAS1-17130; DAAG29-79-C-0161; Grants NSF MCS-82-05335; AF-AFOSR-0198-81)
(NASA-CR-172234; ICASE-83-53; NAS 1.26:172234) Avail: NTIS HC A02/MF A01 CSCL 12A

Approximation techniques for estimating spatially varying coefficients and unknown boundary parameters in second order hyperbolic systems are discussed. Methods for state approximation (cubic splines, tau-Legendre) and approximation of function space parameters (interpolatory splines) are outlined and numerical findings for use of the resulting schemes in model 'one dimensional seismic inversion' problems are summarized. M.G.

N83-36773# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
DENSITY FLUCTUATIONS IN INFINITE FERMI SYSTEMS
W. D. Heiss and R. H. Lemmer (Witwatersrand Univ., Johannesburg, South Africa) Feb. 1982 10 p refs
(TWISK-248) Avail: NTIS HC A02/MF A01

Within the framework of many body theory, a generalized Hartree Fock equation is derived assuming a periodic density fluctuation. In a one dimensional model self consistent solutions are calculated. A band structure of the single particle spectrum and several minima of the total energy appear as novel features. Author

N83-36774# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A TARGET DISTRIBUTION MODEL FOR NONPARAMETRIC DISTRIBUTION ESTIMATION
C. D. Elphinstone Feb. 1983 46 p refs
(CSIR-TWISK-247) Avail: NTIS HC A03/MF A01

A model is proposed which represents a wide class of continuous distributions. It is shown how the parameters of this model can be estimated leading to a distribution estimator and a corresponding density estimator. An important property of this estimator is that it can be structured to reflect a priori knowledge of the unknown distribution. Finally, some examples are shown and some comparisons made with kernel and orthogonal series estimators. Author

N83-36775# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
FUNCTIONAL SENSITIVITY ANALYSIS OF MATHEMATICAL MODELS
D. H. Martin Apr. 1982 12 p refs
(CSIR-TWISK-260) Avail: NTIS HC A02/MF A01

When real dynamical systems or processes are modelled using ordinary differential equations, the question arises of gaging the sensitivity of predictions derived from the model to possible perturbations in various uncertain or assumed expressions or functions which appear in the differential equations. Often, for example, various terms will be assumed to be linear, and sensitivity analysis should then study not only the effects of perturbing the constant of proportionality (parameter sensitivity analysis) but also the effect of abandoning the assumption of linearity (functional sensitivity analysis). A new and potentially useful framework for such functional sensitivity analysis was recently introduced, in which, the entire system of differential equations was considered as being subject to functional perturbations. It has subsequently been realized that this is not always the case, and here the methodology is extended to the case of constrained functional perturbations to the model. Author

N83-36776# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SUBOPTIMAL STRATEGIES FOR STEERING A RANDOM MOTION OF A POINT IN A MULTITARGET ENVIRONMENT
Y. Yavin Mar. 1982 28 p refs
(CSIR-TWISK-250) Avail: NTIS HC A03/MF A01

Consider the random motion of a point M in the plane, and suppose that the velocity v = (v sub 1, v sub 2) of M is perturbed by a Gaussian white noise. It is assumed that l targets are presented in the plane, located at the points c sub 1,...,c sub 1. The observations available to the point M consists of a sum of measurements, each measurement corresponding to a detection that originated from a target, and all detections arriving at random times; plus an R squared-valued Gaussian white noise. Using these observations, the point M wishes, by choosing an appropriate velocity law (strategy), to steer itself into an epsilon neighborhood at the point c sub 1, before it leaves an open and bounded domain which contains all the points c sub 1,...,c sub l. Sufficient conditions on weak optimal feedback strategies are derived. An algorithm for computing weak suboptimal strategies is suggested, and these are computed for a variety of cases. N.W.

N83-36777# Orange Free State Univ., Bloemfontein (South Africa).
QUADRATIC FORMS AND MANIFOLD NORMAL DISTRIBUTIONS
D. J. deWaal Mar. 1982 10 p refs
(CSIR-TR-77) Avail: NTIS HC A02/MF A01

The distribution of quadratic forms in matrix normal variables is considered. An application of the distribution of quadratic forms is given by deriving distributions on manifolds of multivariate normal distributions. Special cases are, for instance, the hyperspherical and spherical normal distributions. Author

N83-36778# Orange Free State Univ., Bloemfontein (South Africa). Dept. of Mathematical Statistics.
A PREDICTIVE APPROACH ON THE DETECTION OF ADDITIONAL INFORMATION IN A MULTIVARIATE LINEAR MODEL
D. J. DeWaal and D. G. Nel Dec. 1981 16 p refs Sponsored by CSIR
(TR-73) Avail: NTIS HC A02/MF A01

A predictive approach for the detection of additional information in a multivariate linear regression model was considered. The predictive density of a future observation on the additional variables under the model that they carry no information was compared with the predictive density under the model that they do carry information. Kullback-Leibler divergences between the densities were used as a measure of comparison. M.G.

N83-36779# Wisconsin Univ., Madison. Mathematics Research Center.
FORMATION OF SINGULARITIES FOR A CONSERVATION LAW WITH MEMORY Technical Summary Report
Reza Malek-Madani (Johns Hopkins Univ., Baltimore) and John A. Nohel Apr. 1983 21 p refs
(Contract DAAG29-80-C-0041)
(AD-A129403; MRCTSR-2501) Avail: NTIS HC A02/MF A01 CSCL 12/1

Problems arising in continuum mechanics can often be modeled by quasilinear hyperbolic systems in which the characteristic speeds are not constant. Such systems have the property that waves may be amplified and solutions that were initially smooth may develop discontinuities ('shocks') in finite time. Of particular interest are situations in which the destabilizing mechanism arising from nonlinear effects can coexist and compete with dissipative effects. An interesting situation arises when the amplification and dissipative mechanisms are nearly balanced and the outcome of their confrontation cannot be predicted at the outset. Examples are provided by quasilinear second order wave equations with first order frictional damping; it has been shown that when the initial data are sufficiently smooth and 'small' in suitable norms, classical solutions exist globally in time. However, if the smooth initial data become sufficiently 'large' in a precise sense, the smooth solution develops a singularity in finite time, no matter how smooth one takes the data. Thus the dissipative mechanism is not sufficiently powerful to prevent the breaking of waves for large enough data. GRA

N83-36780# Carnegie-Mellon Univ., Pittsburgh, Pa. The Robotics Inst.
FAST COMPUTATION OF THE DIFFERENCE OF LOW-PASS TRANSFORM
James L. Crowley and Richard M. Stern Nov. 1982 43 p
(Contract N00039-79-Z-0169)
(AD-A126370; CMR-RI-TR-82-18) Avail: NTIS HC A03/MF A01 CSCL 12/1

The difference of low-pass (DOLP) transform is defined and a fast algorithm for its computation is described. The DOLP is a reversible transform which converts an image into a set of band-pass images. A DOLP transform is shown to require O(N squared) multiplies and produce O(N Log(N)) samples from a N sample image. When Gaussian low-pass filters are used, the result is a set of images which have been convolved with difference of Gaussian (DOG) filters from an exponential set of sizes. A fast computation technique based on resampling is described and shown to reduce the DOLP transform complexity to O(N Log(N))

multiplies and O(N) storage locations. A second technique, cascaded convolution with expansion, is then defined and also shown to reduce the computational cost to O(N log(N)) multiplies. Combing these two techniques yields an algorithm for a DOLP transform that requires O(N) storage cells and requires O(N) multiplies. The DOLP transform provides a basis for a structural description of gray-scale shape. Descriptions of shape in this representation may be matched efficiently to descriptions of shape from other images to determine motion or stereo correspondence. Such descriptions may also be matched independent of their size or image plane orientation. M.G.

N83-36781# Wisconsin Univ., Madison. Mathematics Research Center.

PERIODIC SOLUTIONS OF HAMILTONIAN SYSTEMS OF PRESCRIBED PERIOD Technical Summary Report

Vieri Benci, Alberto Capozzi, and Donato Fortunato Apr. 1983 67 p refs

(Contract DAAG29-80-C-0041)

(AD-A129096; MRC-TSR-2508) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper is divided in two parts. In the first part some abstract critical point theorems are proved using minimax arguments. The second part is devoted to applications. We study the existence of periodic solutions of the Hamiltonian systems. GRA

N83-36782# Ballistic Research Labs., Aberdeen Proving Ground, Md.

ROOTS: THE SEARCH FOR ZEROS OF THE CHARACTERISTICS FUNCTION FOR THE SOLID ROD

James N. Walbert May 1983 20 p refs

(DA Proj. 1L1-62618-AH-80)

(AD-A129089; AD-F300258; ARBRL-MR-03271) Avail: NTIS HC A02/MF A01 CSCL 12/1

The method of calculation of roots of the characteristics equation for the solid rod is presented. Difficulties with Newton's method are shown to be circumvented by application of a modified method of bisections. GRA

N83-36783# Wisconsin Univ., Madison. Center for Mathematics Research.

AUTOMATIC GENERATION OF TAYLOR SERIES IN PASCAL-SC: BASIC OPERATIONS AND APPLICATIONS TO ORDINARY DIFFERENTIAL EQUATIONS

George Corliss (Marquette Univ.) and L. B. Rall Mar. 1983 104 p refs

(Contract DAAG29-80-C-0041)

(AD-A129075; MRC-TSR-2497) Avail: NTIS HC A06/MF A01 CSCL 12/1

Taylor series have a long history of usefulness in numerical analysis, especially for the numerical solution of the initial value problem for systems of ordinary differential equations. Since recurrence relations for coefficients of Taylor series are well known, it is possible to automate the computation of arithmetic operations and various standard functions with arguments which are themselves series. If the language used for scientific computation supports user defined operators and data types, then the facilities built into the language compiler itself can be used to generate machine code for the evaluation of Taylor coefficients. The Pascal-SC (Pascal for Scientific Computation) language offers the user highly accurate floating-point and interval arithmetic, the latter being useful for automatic computation of guaranteed error bounds. GRA

N83-36784# Texas Univ., Austin. Center for Cybernetic Studies.

EXTREMAL AND CAME-THEORETIC CHARACTERIZATIONS OF THE PROBABILISTIC APPROACH TO INCOME REDISTRIBUTION

A. Chernes, S. Duffuss, and M. Intriligator (California Univ., Los Angeles) Mar. 1983 28 p refs

(Contract N00014-82-K-0295)

(AD-A129956; CSS-453) Avail: HC A03/MF A01 CSCL 12/1

In this paper, the problem of income redistribution is cast in two different ways, one as a non-linear goal programming model, and the other as game theoretical model. These two approaches give characterizations for the probabilistic approach suggested by Intriligator for this problem. All three approaches reinforce the linear income redistribution plan as a desirable mechanism of income redistribution. B.W.

N83-36785# Texas Christian Univ., Fort Worth. Inst. of Statistics.

TIME SERIES MODEL IDENTIFICATION BY ESTIMATING INFORMATION

Emanuel Parzen Nov. 1982 32 p refs

(Contract N00014-82-MP-2001)

(AD-A129725; TR-N-35) Avail: NTIS HC A03/MF A01 CSCL 12/1

Statisticians, economists, and system engineers are becoming aware that to identify models for time series and dynamic systems, information theoretic ideas can play a valuable (and unifying) role. This paper discusses how models for a univariate or multivariate time series Y(t) can be formulated as hypotheses about the information divergence between alternative models for the conditional probability density of Y(t) given various bases involving past, current, and future values of Y(.) and related time series X(.). To determine sets of variables that are sufficient to forecast Y(t), and thus to determine a model for Y(t), an approach is presented which estimates and compares various information increments. These information numbers play a central role in studies of causality and feedback. Approximating autoregressive schemes are used to form estimators of the many information numbers that one might compare to identify models for a time series. Author (GRA)

N83-36786# Texas A&M Univ., College Station. Inst. of Statistics.

TIME SERIES ARMA MODEL IDENTIFICATION BY ESTIMATING INFORMATION

Emanuel Parzen Mar. 1983 8 p refs

(Contract N00014-82-MP-2001; Proj. 4226T)

(AD-A129957; TR-N-37) Avail: NTIS HC A02/MF A01 CSCL 12/1

Statisticians, economists, and system engineers are becoming aware that to identify models for time series and dynamic systems, information theoretic ideas can play a valuable (and unifying) role. Models for time series Y(t) can be formulated as hypotheses concerning the information about Y(t) given various bases involving past, current, and future values of Y(.) and related time series X(.). To determine sets of variables that are sufficient to forecast Y(t), and especially to determine an ARMA model for Y(t), an approach is presented which estimates and compares various information increments. The author discusses how to nonparametrically estimate the MA(infinity) representation, and use it to form estimators of the many information numbers that might compare to identify an ARMA model for a univariate time series. Author (GRA)

N83-36787# Maryland Univ., College Park. Lab. for Numerical Analysis.

ADAPTIVE METHODS AND ERROR ESTIMATION FOR ELLIPTIC PROBLEMS OF STRUCTURAL MECHANICS Final Report

I. Babuska, A. Miller, and M. Vogelius Jun. 1983 20 p refs

(Contract N00014-77-C-0623)

(AD-A130176; BN-1009) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors develop a class of feedback finite element methods for a one dimensional boundary value problem and state some mathematical results about their optimality with respect to various performance measures. Analogues ideas and results are discussed for a two dimensional problem from plane elasticity. A post-processing technique aimed at computing the value of a functional with high accuracy is also described and illustrated by an example. Author (GRA)

N83-36788# Maryland Univ., College Park. Lab. for Numerical Analysis.
THE APPROXIMATION THEORY FOR THE P-VERSION OF THE FINITE ELEMENT METHOD, PART 1 Final Report
Milo R. Dorr May 1983 59 p refs
(Contract N00014-77-C-0623)
(AD-A129806; BN-1004) Avail: NTIS HC A04/MF A01 CSCL 12/1

In its standard mathematical formulation, the finite element method is a particular kind of Ritz-Galerkin procedure in which the approximating finite-dimensional subspaces are composed of piecewise polynomials defined on a partition of the given domain into convex subdomains. Since the convergence of such methods is obtained by increasing the dimension of these subspaces in some manner, one observes that there are basically two ways this can be done. The first way is the traditional approach obtained by fixing the degree p of the piecewise polynomials at some value (p = 1,2,3) and decreasing the mesh size h in order to achieve convergence; this is known as the h-version of the finite element method. The second way, referred to as the p-version of the finite element method, is to fix the mesh and increase the degree p in order to reduce the approximation error. Clearly, a combination of the two is also possible. While the h-version has been extensively investigated in the mathematical literature and have been widely used in engineering applications for many years, the development of the p-version has taken place only recently. It is now recognized that for many problems of engineering and scientific interest, the p-version offers a number of advantages over the h-version both in the quality of approximation and in the cost of computation. GRA

N83-36789# Maryland Univ., College Park. Lab. for Numerical Analysis.
IDENTIFICATION OF AN UNKNOWN CONDUCTIVITY BY MEANS OF MEASUREMENTS AT THE BOUNDARY Final Report
Robert V. Kohn and Michael Vogelius Jun. 1983 15 p refs Sponsored in part by the Mathematical Sciences Research Inst., Berkeley, Calif.
(Contract N00014-77-C-0623)
(AD-A129809; BN-1005) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors present a summary of results concerning the determination of an unknown conductivity by means of static measurements at the boundary. The main emphasis is on identifiability; they only briefly discuss the reconstruction problem. Some references are given to related work for time dependent problems. Author (GRA)

N83-36790# Texas A&M Univ., College Station. Inst. of Statistics.
MODELING EPISODIC TIME SERIES
H. Joseph Newton Oct. 1982 13 p refs
(Contract N00014-82-MP-2001)
(AD-A129729; TR-N-34) Avail: NTIS HC A02/MF A01 CSCL 12/1

A particular form of filtered Poisson process is suggested for modeling time series data tht contain episodes, i.e., large, exponentially decaying excursions away from baseline values of the series. The properties of this process are derived and the principle of conditional least squares estimation is used to obtain consistent, asymptotically normal estimators of the average excursion heights and the decay rate parameter. The method is illustrated using hormone levels data. Author (GRA)

N83-36791# Dayton Univ., Ohio. Analysis Mechanics Group.
MAGNA (MATERIALLY AND GEOMETRICALLY NONLINEAR ANALYSIS). PART 1: FINITE ELEMENT ANALYSIS MANUAL Final Report, Mar. 1980 - Dec. 1982
R. A. Brockman Wright-Patterson AFB, Ohio AFWAL Dec. 1982 694 p refs Supersedes AFWAL-TR-81-3181
(Contract F33615-80-C-3403; AF Proj. 2402)
(AD-A129773; AFWAL-TR-82-3098-Pt-1; AFWAL-TR-81-3181; UDR-TR-82-111) Avail: NTIS HC A99/MF A01 CSCL 12/1

The finite element program MAGNA (Materially and Geometrically Nonlinear Analysis), developed for the nonlinear static and dynamic analysis of complex three-dimensional structures, is described. This program is applicable to large structural response problems involving bars, membranes, beams, plates, shells, and three-dimensional solids, experiencing large displacements, finite strains, large rotations, and plastic deformation. The theoretical basis of MAGNA and the numerical procedures employed are described in detail. Several sample analyses are presented to demonstrate the range of capabilities of the program. Instructions are provided for operating the program, modifying storage capacity, preparing input data, estimating computer run times, and interpreting the output. Computer graphics utilities available for the display of input data and analysis results are also described. Author (GRA)

N83-36792# Maryland Univ., College Park. Lab. for Numerical Analysis.
THE POST-PROCESSING APPROACH IN THE FINITE ELEMENT METHOD. PART 3: A POSTERIORI ERROR ESTIMATES AND ADAPTIVE MESH SELECTION Final Report
I. Babuska and A. Miller Jun. 1983 35 p refs
(Contract N00014-77-C-0623)
(AD-A129784; BN-1007) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is the final in a series of three in which the authors discussed a finite element post-processing technique. Here they shall deal with the questions of adaptive mesh selection and a posteriori error estimation. Some numerical examples computed by the FEARS program will be used to illustrate the approaches taken. Author (GRA)

N83-36793# Virginia Polytechnic Inst. and State Univ., Blacksburg.
TIME DOMAIN TECHNIQUES IN THE SINGULARITY EXPANSION METHOD Final Report
W. A. Davis and D. J. Riley Wright-Patterson AFB, Ohio AFWL May 1983 42 p refs
(Contract F29601-81-K-0019; AF Proj. 3763)
(AD-A129794; AFWL-TR-82-156) Avail: NTIS HC A03/MF A01 CSCL 12/1

The use of the singularity expansion method (SEM) to calculate the time-domain response of an object to an incident electromagnetic wave has shown the promise of being extremely useful. However, the work to data has been hindered by the requirement for very large matrices which limited the application to one-dimensional geometrics with relatively few unknowns. This study extends the applicability of time domain SEM to two dimensions and extends numerical time-domain techniques in general.
Author (GRA)

N83-36794# Rome Air Development Center, Griffiss AFB, N.Y.
A PROOF OF THE ODD-SYMMETRY OF THE PHASES FOR MINIMUM WEIGHT PERTURBATION, PHASE-ONLY NULL SYNTHESIS
Robert A. Shore Apr. 1983 19 p refs
(AF Proj. 2305)
(AD-A130513; RADC-TR-83-96) Avail: NTIS HC A02/MF A01 CSCL 12/1

A proof is given of the odd-symmetry property of the phase perturbations required to impose nulls in a real linear array antenna pattern using phase-only weight control subject to minimization of the absolute weight perturbations. The perturbed weights are, therefore, conjugate symmetric with respect to a phase reference at the center of the array, and the perturbed pattern is real.
Author (GRA)

N83-36795# Wisconsin Univ., Madison. Div. of Mathematical Sciences.
A STABLE ADAPTIVE NUMERICAL SCHEME FOR HYPERBOLIC CONSERVATION LAWS
Bradley J. Lucier (Purdue Univ., Lafayette, Ind.) May 1983 44 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A130512; MRC-TSR-2517) Avail: NTIS HC A03/MF A01 CSCL 12/1

Certain problems in gas dynamics, oil reservoir simulation and other fields can be modeled by hyperbolic conservation laws, a class of partial differential equations. The solutions of such problems are typically made up of smooth surfaces separated by discontinuities, or shocks. Usually, less information is needed to specify the solution in the smooth regions than in the shock regions. In this paper the author introduces a stable finite-difference scheme for conservation laws that incorporates a time-varying, nonuniform computational mesh. At any given time, his mesh selection algorithm chooses a mesh based on the approximation calculated up to the time. The algorithm uses knowledge of a solution's structure to reduce the number of meshpoints in the regions where the solution is smooth. This reduces the method's computational complexity while maintaining full accuracy. He proves that his method is stable for the complete nonlinear problem, and that it converges for linear problems. Given are examples where the method is asymptotically faster than previous ones. GRA

N83-36796# Wisconsin Univ., Madison. Center for Mathematics Research.

A MULTIPLICITY RESULT FOR A SEMILINEAR DIRICHLET PROBLEM

J. V. A. Goncalves (Brasilia Univ.) Apr. 1983 19 p refs

(Contract DAAG29-80-C-0041)

(AD-A130492; MRC-TSR-2515) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper the author considers the number of solutions of the Dirichlet problem for semilinear elliptic equations. Specifically he studies the question of finding solutions u of an equation such as delta u + g(u) = lambda in a bounded domain omega included in R sub n subject to the condition that u vanishes on the boundary of omega. This problem has been intensively studied in the last few years; it arises in many situations such as nonlinear diffusion generated by nonlinear sources, the thermal ignition of gases, and others. This paper derives precise estimates of the number of solutions under assumptions which are natural for these problems thereby complementing results obtained by a number of authors. GRA

N83-36797# Wisconsin Univ., Madison. Center for Mathematics Research.

RESONANCE ZONES IN TWO-PARAMETER FAMILIES OF CIRCLE HOMEOMORPHISMS

Glen Richard Hall May 1983 14 p refs Sponsored in part by NSF

(Contract DAAG29-80-C-0041)

(AD-A130493; MRC-TSR-2519) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider a two-parameter family of diffeomorphisms of the circle where one of the parameters controls the amount of rigid rotation while the second controls the nonlinearity. In particular, we show that the regions in the parameter plane for which the map has a periodic orbit of a particular rotation number (resonance zones) increase in size linearly as the second parameter is increased from zero. This is a discretization of the phenomenon known as phase locking for ordinary differential equations. Using this we obtain some results on the smoothness of the curves between the resonance zones. Author (GRA)

N83-36798# Wright State Univ., Dayton, Ohio. Dept. of Mathematics and Statistics.

MULTIVARIABLE LINEAR DIGITAL CONTROL VIA STATE SPACE OUTPUT MATCHING

David F. Miller Jan. 1983 30 p refs

(Grant AF-AFOSR-0208-82)

(AD-A129262; AFOSR-83-0487TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A direct state space approach to the digital control of multivariable linear systems is presented. Control is provided by minimizing the mean square error between controlled plant outputs and specified desired output trajectories at sampling instants. Linear equations for digital control inputs are solved in constant forward and feedback gain form. Numerical applications to problems in simple model following, digital redesign, and direct digital design are given. Author (GRA)

N83-36799# Brown Univ., Providence, R. I. Center for Dynamical Systems.

STABILITY IN LINEAR DELAY EQUATIONS

Jack K. Hale, Ettore F. Infante, and Peter Fu-Shiang Aug. 1982 36 p refs

(Contract DAAG29-79-C-0161; Grants AF-AFOSR-81-0198; NSF MCS-79-05774; AF Proj. 2304)

(AD-A129264; LCDS-82-23; AFOSR-83-0482TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

For linear autonomous differential difference equations of retarded or neutral type, necessary and sufficient conditions are given for the zero solution to stable (hyperbolic) for all values of the delays. Author (GRA)

N83-36800# Kentucky Univ., Lexington. Dept. of Electrical Engineering.

SYNTHESIS OF OPTIMAL DIGITAL CONTROLLER FOR CONTINUOUS-DATA MODEL-FOLLOWING Final Report, 1 May - 31 Aug. 1982

Hsi-Han Yeh Jan. 1983 88 p refs

(Grant AF-AFOSR-0207-83; AF Proj. 2304)

(AD-A129288; AFOSR-83-0461TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

The digitalization of flight control systems has been of increasing interest to the Air Force. One of the problems confronting the designer is the real-time implementation of advanced control algorithms within the computational capability of the on-board computer. In converting a continuous-data (analog) controller into a digital controller, ad hoc approaches such as bilinear transform and prewarped Tustin transform techniques have typically been used. These methods have the advantage of being straightforward and easy to use, and they are intuitively appealing. But the performance of a system digitalized by these approaches resembles the performance of the baseline (continuous) system only when the sampling frequency is relatively high, because the dynamics of the plant and the feedback structure of the system are not taken into consideration. GRA

N83-36801# Texas A&M Univ., College Station. Dept. of Electrical Engineering.

EFFICIENT COMPUTATION FOR LARGE SCALE OPTIMIZATION Final Report, 1 Jun. - 31 Aug. 1982

John A. Fleming Nov. 1982 67 p refs

(Grant AF-AFOSR-0212-82)

(AD-A129293; AFOSR-83-0445TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Several classes of algorithms for solution of the general nonlinear programming (constrained optimization) problem, and four specific implementations of these were chosen and evaluated with respect to expected speed of computation. A test problem based on the path generation problem of terrain following/terrain aviodance flight was developed, and the performance of the chosen optimization procedures was compared. It was found that the generalized reduced gradient method was faster and moe reliable that either of two augmented Lagrangian methods and a quadratic approximation method. However, the solution time for the TF/TA type problems was found to be far in excess of what would be required. Several simplifications of the problem statement were attempted in order to decrease computation time without compromising the integrity of the solution. GRA

N83-36802# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Mathematics/Computer Science.

SOME COMMON-SENSE OPTIMIZATION TECHNIQUES FOR NON-DIFFERENTIAL FUNCTIONS OF SEVERAL VARIABLES Final Report, 1 Jun. 1980 - 30 Jun. 1983

Bolindra N. Borah and James F. Chew 2 Jun. 1983 52 p refs

(Grant DAAG29-80-G-0004)

(AD-A129549; ARO-17435.1-MA-H) Avail: NTIS HC A04/MF A01 CSCL 12/01

The problem of obtaining global optima of non-differentiable functions of several variables is studied. In general, the functions are multimodal and continuous on a compact domain. Two distinct methods are proposed and to some extent compared: The method of systematic search and the random search technique. In both cases it is assumed that the functions are defined and continuous on a compact domain. They are also assumed to be multimodal functions. In general the systematic search does not provide all the optimal points, the primary emphasis here being location of a global optimum. Despite several restrictions and difficulties, the Random Search method attempts to obtain all the optima, one optimum point in each mode. GRA

N83-36803# City Coll. of the City Univ. of New York. Dept. of Mathematics.

IFR (INCREASING FAILURE RATE) FOR REPAIRABLE SYSTEMS

N. R. Chaganty Apr. 1983 10 p refs

(Grant AF-AFOSR-0024-82; AF Proj. 2304)

(AD-A129553; AFOSR-83-0511TR; CUNY-MB4; TR-82-04-AFOSR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document considers k-out-of-n system with independent repairable components. It assumes that the repair and failure distributions are exponential with parameters micron (sub 1, ..., micron sub n) and (lambda sub 1,..., lambda sub n) respectively. In this paper the author shows that if lambda sub i-micron sub i = delta for all i then the life distribution of the system is Increasing Failure Rate. GRA

N83-36804# Battelle Columbus Labs., Ohio.

ELASTIC COMPLIANCE AND STRESS INTENSITY FACTOR SOLUTIONS FOR COMPACT SPECIMEN GEOMETRIES Final Report, 1 Jan. - 30 Sep. 1982

V. Papaspyropoulos and J. Ahmad Wright-Patterson AFB, Ohio AFWAL Feb. 1983 17 p refs

(Contract F33615-79-C-5129; AF Proj. 2307)

(AD-A129560; AFWAL-TR-82-4199) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two-dimensional linear elastic finite element analyses of several compact tension test specimen geometries were performed. Eight noded isoparametric and singular stress triangular quarter-point elements were used. The results include stress intensity factors and compliance at selected locations as functions of crack length. Author (GRA)

N83-36805# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.

RECOVERING 2-D MOTION PARAMETERS IN SCENES CONTAINING MULTIPLE MOVING OBJECTS Interim Technical Report

Gilad Adiv May 1983 29 p refs Presented at the DARPA Image Understanding Workshop, Arlington, Va., Jun. 1983

(Contracts N00014-82-K-0464; N00014-75-C-0459)

(AD-A129565; COINS-TR-83-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

A method for extracting the motion parameters of several independently moving objects from displacements field information is described. The method is based on a generalized Hough transform technique. Some of the problems of this technique are addressed and appropriate solutions are proposed. A modified multipass Hough transform approach has been implemented, where in each pass windows are located around objects and the transform is applied only to the displacement vectors contained in these windows. The windows are determined by the degree to which the displacement field is locally inconsistent with previously found motion transformations. Thus, the sensitivity of the Hough transform to local events is increased and the motion parameters of small objects can be detected even in a noisy displacement field. The author also use a multi-reslution scheme in both the image plane and the parameter space and thus reduce the computational cost of the technique. The method is demonstrated by experiments based on artificial images with four parameters of 2-d motion: rotation, expansion and translation in both axes. Author

N83-36806# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.

GROUP COMPLEMENTARY CODES WITH OPTIMIZED APERIODIC CORRELATION

E. M. Holiday and G. W. Weathers Apr. 1983 30 p refs

(AD-A130013; AD-E950401; DRSMI/RE-83-5-TR) Avail: NTIS HC A03/MF A01 CSCL 09/4

This document describes the structure and properties of an innovative new waveform design for pulse compression processing in target sensor systems. The waveform design, which is called group complementary codes, provides sets of binary word groups which have the combined properties of optimized aperiodic autocorrelation and optimized cross correlation between word sets. The optimized aperiodic autocorrelation property allows the implementation of pulse compression processing in sensor systems to achieve zero value temporal or range sidelobes within the principal interpulse period without resorting to weighting techniques for sidelobe reduction. Weighting techniques for sidelobe reduction in a pulse compression system result in a broadened mainlobe and mismatch loss. These undesirable properties can be avoided through the utilization of group complementary codes. The orthogonal nature of group complementary codes, apparent from their absence of cross correlation between sets, implies that sensors using these code sets may be deployed in close proximity, using the same carrier frequency without direct path mutual interference when synchronized. Indirect path interference is minimized even when transmissions are not synchronized.

Author (GRA)

N83-36807# Illinois Univ., Chicago. Dept. of Quantitative Methods.

DETERMINING THE NUMBER OF COMPONENT CLUSTERS IN THE STANDARD MULTIVARIATE NORMAL MIXTURE MODEL USING MODEL-SELECTION CRITERIA

Hamparsum Bozdogan 16 Jun. 1983 49 p refs Presented at the 14th Ann. Meeting of the Classification Soc., Philadelphia, 29-31 May 1983

(Contract DAAG29-82-K-0155)

(AD-A130020; UIC/DQM/A83-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of clustering individuals is considered within the context of a multivariate normal mixture using model-selection criteria. Often, the number K of components in the mixture is not known. In practical problems, the question arises as to the appropriate choice of k. The problem is to decide how many components are in the mixture, a difficult multiple decision problem. What the null distribution of the criterion is if the data acutally contain k clusters is not known, and remains largely unresolved still. Two well known model-selection criteria, namely Akike's Information Criterion (AIC) and Schwarz's Criterion are proposed for the first time as two new approaches to the problem of what the appropriate choice of k in the mixture multinormal model should be. The forms of these two model-selection criteria are obtained in the standard multivariate normal mixture model. The results are obtained when data initially partitioned into equal size groups; when data initially reordered; when data initialized by k-means algorithm; when data initialized by special initialization scheme; and when special initialization scheme is used on reordered data. GRA

N83-36808# North Carolina Univ., Chapel Hill. Dept. of Statistics.

A FINITELY ADDITIVE WHITE NOISE APPROACH TO NONLINEAR FILTERING

G. Kallianpur and R. L. Karandikar Oct. 1982 37 p refs

(Contract F49620-82-C-0009; AF Proj. 2304)

(AD-A129224; TR-21; AFOSR-83-0447TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A finitely additive white noise approach to nonlinear filtering is developed. It is shown that a pathwise solution of the problem is possible where the observed paths belong to the reproducing kernel

Hilbert space of the Wiener process. Connections with robust filtering and recent developments are explored. Author (GRA)

N83-36809# Wisconsin Univ., Madison. Mathematics Research Center.
APPROXIMATION SCHEMES FOR VISCOSITY SOLUTIONS FOR HAMILTON-JACOBI EQUATIONS Technical Summary Report
Panagiotis E. Souganidis Apr. 1983 111 p refs
(Contract DAAG29-80-C-0041)
(AD-A129187; MRC-TSR-2511) Avail: NTIS HC A06/MF A01 CSCL 12/1

Equations of Hamilton-Jacobi type arise in many areas of application, including the calculus of variations of variations, control theory and differential games. Recently Crandall and Lions established the correct notion of generalized solutions for these equations. This article discusses the convergence of general approximation schemes to this solution and gives, under certain hypotheses, explicit error estimates. These results are then applied to obtain various representations. These include max-min representations of solutions relevant to the theory of differential games (which imply the existence of the value of the game), representations as limits of solutions of general explicit and implicit finite difference schemes, and as limits of several types of Trotter products. Author (GRA)

N83-36810# Wisconsin Univ., Madison. Mathematics Research Center.
ON A NONLINEAR DEGENERABLE PARABOLIC EQUATION IN INFILTRATION OR EVAPORATION THROUGH A POROUS MEDIUM Technical Summary Report
J. Ildefonso Diaz and Robert Kersner Apr. 1983 45 p refs
(Contract DAAG29-80-C-0041)
(AD-A129186; MRC-TSR-2502) Avail: NTIS HC A03/MF A01 CSCL 12/1

During the last two decades a great deal of progress has been made on the mathematical analysis of flows through porous media. Such phenomena led to degenerate nonlinear parabolic equations. The equations obtained are of different nature when the fluid movement takes place in a horizontal column of the medium rather than in a vertical column of the medium. The latter case gives rise to first order nonlinear perturbations of the former case and equations of this more general sort also model the evaporation of a fluid through a porous medium. A significant technical difficulty arises in the evaporation case; the first order nonlinear terms can be singular at the points where the solution vanishes. In this paper the authors give a mathematical treatment of the Cauchy problem as well as the first and mixed boundary value problems for the relevant equations. Existence, continuity and uniqueness of generalized solutions are proved thereby improving earlier results in the mathematical literature. GRA

N83-36811# Wisconsin Univ., Madison. Mathematics Research Center.
A VERY SMALL REMARK ON SMOOTH DENJOY MAPS OF THE CIRCLE Technical Summary Report
Glen Richard Hall Apr. 1983 14 p refs
(Contract DAAG29-80-C-0041)
(AD-A129185; MRC-TSR-2512) Avail: NTIS HC A02/MF A01 CSCL 12/1

Maps of a circle into itself, when considered as discrete dynamical systems, have been observed to contain some of the qualitative behavior of complicated experimental situations. Much of this structure can be understood for homeomorphisms of the circle by considering the invariant called the rotation number. In fact, the homeomorphisms of the circle with irrational rotation number can be classified up to topological conjugacy, provided the map and its inverse are sufficiently smooth. Counter examples to this classification scheme exist which are C sub 1 diffeomorphisms or C infinity homeomorphisms with nondifferentiable inverse. Whether C infinity can be replaced with analytic in the second examples is an open question. In this report the authors show that if certain assumptions are made on the rotation number and on the derivative of a homeomorphism from the circle onto itself, then even if the map does not fit into the classification scheme we can still obtain estimates on the behavior of its orbits under iteration. GRA

N83-36812# Princeton Univ., N. J. Lab. for Information Sciences and Systems.
A NEW GENERALIZED CROSS-CORRELATOR Technical Progress Report, Sep. 1982 - Mar. 1983
Alfred Hero and Stuart C. Schwartz Apr. 1983 38 p refs Presented at the Conf. on Inform. Sci. and Systems, Baltimore, 23-25 Mar. 1983
(Contract N00014-81-K-0146)
(AD-A129692; TR-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new Generalized Cross-Correlator (GCC) for the passive time delay estimation problem is presented. The interpretation of this GCC is that of estimating the cross-correlation function by cross-correlating the least mean square estimates of the signal component in each of the observed waveforms. The implementation is simply a GCC with the weighting filter equal to the magnitude coherency squared. Numerical evaluation of the performance of this processor and a robust version indicates that they compare favorably to some of the well known GCC procedures. Author (GRA)

N83-36813# Pennsylvania Univ., Philadelphia. Dept. of Systems Engineering.
ROBUST WIENER FILTERING FOR MULTIPLE INPUTS WITH CHANNEL DISTORTION Interim Report
Cheng-Tie Chen and Saleem A. Kassam 1983 13 p refs Submitted for publication
(Grant AF-AFOSR-0022-82; AF Proj. 2304)
(AD-A129648; AFOSR-83-0507TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Robust Wiener filtering has previously been considered for the single-input (scalar) case where there is no channel distortion and where the signal to be estimated is the source signal itself. In this correspondence, the authors extend these results to the multiple-input (vector) case where linear channel distortion is allowed and the signal to be estimated is a linear-filtered version of the source signal. The results ae obtained from those for the single-input case by modifying appropriately the constraints on signal and noise characteristics. Such a modification is motivated by an examination of the expression of the mean-square error for the optimum filter. GRA

N83-36814# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
THE AEMS (ANALYSIS OF ELECTRICAL AND MECHANICAL SYSTEMS) PROJECT IN APPLIED MATHEMATICS AT CARNEGIE-MELLON UNIVERSITY Final Report, Jul. 1951 - Dec. 1982
Richard J. Duffin Dec. 1982 76 p
(Contract DAAG29-80-G-0037)
(AD-A129609; ARO-16785.9-MA; DA-36-061-ORD-113) Avail: NTIS HC A05/MF A01 CSCL 12/1

This is a record of a research project in applied mathematics at Carnegie-Mellon University. The project is called Analysis of Electrical and Mechanical Systems or AEMS for short. The goals of AEMS were threefold: (1) to apply mathematical analysis to treat new problems arising in science and technology; (2) to develop new mathematical concepts and structures using facets of science and technology as models; and (3) to help students start a career in the interesting area of applied mathematics. GRA

N83-36815# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
PREDICTION OF FUTURE OBSERVATIONS IN POLYNOMIAL GROWTH CURVE MODELS, PART 1
C. Radakrishna Rao Mar. 1983 17 p refs Presented at Indian Statist. Inst., Calcutta, Dec. 1981
(Contract F49620-82-K-0001; AF Proj. 2304)
(AD-A129359; Rept-83-05-Pt-1; AFOSR-83-0491TR-Pt-1) Avail:

NTIS HC A02/MF A01 CSCL 12/1

The problem considered is that of simultaneous prediction of future measurements on a given number of individuals using their past measurements. Assuming a polynomial growth curve model, a number of methods are proposed and their relative efficiencies in terms of the compound mean square prediction error (CMPSE) are compared. There is a similarity between the problem of simultaneous estimation of parameters as considered by Stein and that of simultaneous prediction of future observations. It is found that the empirical Bayes predictor (EBP) based on the empirical Bayes estimator (EBE) of the unknown vector parameters in several linear models proposed by the author (Rao, 1975) has the best possible efficiency compared to the others studied. The problem of determining the appropriate degree of the polynomial growth curve is also studied from the point of view of minimizing the CMSPE. Author (GRA)

N83-36816# Princeton Univ., N. J. Information Sciences and Systems Lab.

APPROXIMATION OF LOCALLY OPTIMUM DETECTOR NONLINEARITIES

Steven V. Czarnecki and Kenneth S. Vastola Mar. 1983 5 p refs

(Contract N00014-81-K-0146)

(AD-A129695) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of finding a detector nonlinearity which maximizes the efficacy (or asymptotic processing gain) over a class of suboptimal nonlinearities is considered. It is shown that this efficacy maximization problem is essentially the same as the problem of finding the minimum mean square error approximation to the locally optimal detector nonlinearity. This result is compared to some intuitive ideas about suboptimal detection. Author (GRA)

N83-36817# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.

THE PMC (PREPARATA, METZE AND CHIEN) SYSTEM LEVEL FAULT MODEL: MAXIMALITY PROPERTIES OF THE IMPLIED FAULTY SETS

Gerard G. L. Meyer 15 May 1983 18 p refs

(Contract N00014-80-C-0772)

(AD-A129385; JHU/EECS-83/03) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, we examine the implied faulty sets in the case of the PMC system level fault model. We show that those sets possess a maximality property whenever the system is one-step tau-diagnosable, no two modules test each other and the number of faulty modules is no larger than tau. In addition, we propose a syndrome-decoding algorithm based on that maximality property. Author (GRA)

N83-36818# Tennessee Univ., Knoxville. Dept. of Mathematics.

MIXED FINITE ELEMENT METHODS WITH APPLICATIONS TO FLOW AND OTHER PROBLEMS Final Report, 1 Jan. 1980 - 31 Mar. 1983

Max D. Gunzburger 31 May 1983 17 p refs

(Grant AF-AFOSR-0083-80; AF Proj. 2304)

(AD-A130678; AFOSR-83-0624TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The thrust of this work was the development of efficient and accurate finite element methods for flow problems. Specific applications include periodic acoustic problems, potential flow problems and incompressible viscous flows. However, the theoretical analyses carried out also have a direct bearing on the approximation of problems in other areas, e.g., electromagnetics and elasticity. For the particular fluids applications mentioned above, computer codes implementing the algorithms have also been developed. GRA

N83-36819# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

AN EVALUATION OF A GLOBAL METHOD APPLIED TO STIFF ORDINARY DIFFERENTIAL EQUATIONS

L. Rolfes and J. A. Snyman (Pretoria Univ.) Mar. 1982 28 p refs

(CSIR-TWISK-251) Avail: NTIS HC A03/MF A01

A global method for the initial-value problem is re-evaluated as a method for solving stiff ODEs. In the non-stiff case this method is unsuitable because the difference equation obtained, possesses a dominant parasitic solution. For stiff problems, however, the parasitic solution does not become dominant and the method may be applied. The method is insensitive to the stiffness of the problem. Numerical results show that the method is robust and reliable for solving stiff systems of ordinary differential equations, and that it is efficient when moderate accuracy is desired. N.W.

N83-36820# Sandia Labs., Albuquerque, N. Mex.

BOOLEAN METHODS OF OPTIMIZATION OVER INDEPENDENCE SYSTEMS

Bernie L. Hulme 1983 14 p refs Presented at the SIAM Conf. on the Appl. of Discrete Math., Cambridge, Mass., 27 Jun. 1983

(Contract DE-AC04-76DP-00789)

(DE83-013671; SAND-83-1304C; CONF-830647-1) Avail: NTIS HC A02/MF A01

This paper presents both a direct and an iterative method of solving the combinatorial optimization problem associated with any independence system. The methods use Boolean algebraic computations to produce solutions. In addition, the iterative method employs a version of the greedy algorithm both to compute upper bounds on the optimum value and to produce the additional circuits needed at every stage. The methods are extensions of those used to solve a problem of fire protection at nuclear reactor power plants. DOE

N83-36821# California Univ., Livermore. Lawrence Livermore Lab.

COULOMB WAVEFUNCTION EVALUATION VIA COULFG

R. L. Pexton May 1983 13 p refs

(Contract W-7405-eng-48)

(DE83-013620; UCID-19736) Avail: NTIS HC A02/MF A01

A continued-fraction method provides a foundation for evaluating Coulomb wavefunctions to high accuracy. Development of the method originated by J. W. Steed, allowable options, range of parameters, and warning of when solutions may deteriorate are discussed. DOE

N83-36822# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.

A BOUNDARY-FITTED COORDINATE CODE FOR GENERAL TWO-DIMENSIONAL REGIONS WITH OBSTACLES AND BOUNDARY INTRUSIONS Final Report, Jun. 1978 - May 1982

Joe F. Thompson Mar. 1983 85 p refs

(Contract DACW39-78-C-0054)

(AD-A129482; WES/TR/E-83-8) Avail: NTIS HC A05/MF A01 CSCL 12/1

A code (WESCOR) for the generation of boundary-fitted coordinate systems for general two-dimensional regions with boundaries of arbitrary shape and with internal obstacles and boundary intrusions, arbitrary in shape and number, is described and instructions for input and use are given. The coordinate system is generated from the numerical solution of a system of elliptic partial differential equations with provision for controlling the spacing of the coordinate lines in the field. The transformed (computational) region is rectangular with the obstacles and intrusions transformed to slits and/or slabs. A small code to distribute points on various fundamental curves with exponential concentration is also described. This front-end code can be used to construct boundary point distributions for input to the coordinate code. A plot code for the coordinate system is also included. The boundary-fitted coordinate systems generated by this code may be used as a basis for the numerical solution of partial differential equations for any physical problem of interest. This procedure will be particularly useful where numerical models are used to analyze flow problems with complex boundary conditions. Typical examples are riverine analysis or the design and evaluation of selective withdrawal outlet works. Author (GRA)

N83-36823# Boeing Computer Services, Inc., Seattle, Wash. Mathematics and Modeling Unit.
A STRUCTURALLY STABLE MODIFICATION OF HELLERMAN-RARICK'S P4 ALGORITHM FOR REORDERING UNSYMMETRIC SPARSE MATRICES
A. M. Erisman, R. G. Grimes, J. G. Lewis, and W. G. Poole, Jr. Apr. 1983 50 p refs
(Contract F49620-81-C-0072; AF Proj. 2304)
(AD-A129344; MM-3; AFOSR-83-0479TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The Partitioned Preassigned Pivot Procedure of Hellerman and Rarick reorders unsymmetric sparse matrices in order to decrease computation and storage requirements when solving sparse systems of linear equations. It is known that the algorithm, when applied to matrices which are not structurally singular, can generate intermediate matrices which are structurally singular, causing a breakdown in the elimination process. In this paper its authors present the algorithm in a structured, top-down, form and explain several of the problems which may occur. We then define a modification of the algorithm to treat the difficulties. This revised version of the algorithm will never produce structurally singular intermediate matrices if the original matrix is not structurally singular. Test results with this modified algorithm show that it is as effective as the Markowitz algorithm as a preordering when the block structure of the new algorithm is recognized and used.
Author (GRA)

N83-36824# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
MEASURING STIFFNESS
Lawrence F. Shampine Jun. 1983 30 p refs
(Contract DE-AC04-76DP-00789)
(DE83-014792; SAND-83-1119) Avail: NTIS HC A03/MF A01

Many problems have been proposed for the testing and evaluation of mathematical software for the solution of the initial value problem for a system of ordinary differential equations. The stiffness of a given problem is of great significance for testing, but the concept is at best somewhat vague and the few quantitative measures of stiffness being used are of limited value. A relatively precise and quantitative way is proposed to answer the questions: how does the stiffness vary in the course of the integration of a given problem. Is a given problem A stiffer than a given problem B, and if so, by how much.
DOE

N83-36825# Stanford Univ., Calif. Systems Optimization Lab.
COMBINATORIAL APPROACH TO SOME SPARSE-MATRIX PROBLEMS
S. Thomas McCormick Jun. 1983 74 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; DAAG29-81-K-0156; Grants NSF MCS-81-19774; NSF MCS-79-26009)
(DE83-014641; SU-SOL-83-5) Avail: NTIS HC A04/MF A01

The various methods for choosing difference directions are classified it is shown that finding an optimally small set ofdirections for any of the four sub-varieties of the Direct Methods is NP-Complete. the complexity results are obtained by showing that finding optimal sets of difference directions is equivalent to relate graph coloring problems. The second problem was shown to be NP-Complete. By adopting a fairly mild non-degeneracy assumption, a low-order polynominal algorithm which reduces given constraints into an optimally sparse equivalent set of constraints is derived. This algorithm is based on bipartite matching theory, and it induces a partial order on the rows of the matrix which is related to Dulmage-Mendelsohn decomposition. The proof that the algorithm is correct yields a performance guarantee when the algorithm is applied to real data, and several modifictions that improve its running time are discussed. Some computational experience is presented which indicates that the algorithm may be practically useful as a preprocessor for linearly constrained optimization. The reltionship of this research to finding optimally sparse null-space bases, and to the complexity of matroid oracles is also discussed.
DOE

N83-36090*# Pennsylvania State Univ., University Park. Dept. of Mathematics.
FINITE DIFFERENCE NUMERICAL METHODS FOR BOUNDARY CONTROL PROBLEMS GOVERNED BY HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS
Goong Chen, Quan Zheng, Matthew Coleman, and Sunethra Weerakoon *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 477-495 refs (For primary document see N83-36061 24-18)
(Grant NSF MCS-81-01892)
Avail: NTIS HC A99/MF A01 CSCL 12A

N83-36093*# Warwick Univ. Coventry (England).
JOINT STATE AND PARAMETER ESTIMATION
N. Carmichael and M. D. Quinn (Sheffield City Polytechnic, England) *In* JPL Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 521-529 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 12A

N83-36095*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A FUNCTION SPACE APPROACH TO STATE AND MODEL ERROR ESTIMATION FOR ELLIPTIC SYSTEMS
G. Rodriguez *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 547-573 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 12A

N83-36096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STATE AND MODEL ERROR ESTIMATION FOR ELLIPTIC SYSTEMS: APPLICATIONS TO LARGE ANTENNA STATIC SHAPE DETERMINATION
G. Rodriguez and R. E. Scheid, Jr. *In its* Proc. of the Workshop on Appl. of Distributed System Theory to the Control of Large Space Struct. 1 Jul. 1983 p 575-603 refs (For primary document see N83-36061 24-18)
Avail: NTIS HC A99/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N83-36826# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
RELIABILITY CONSTRAINED RESERVOIR CONTROL PROBLEMS. 2: RANDOM STRATEGIES
Moshe Sniedovich and Peter A. Nielsen Mar. 1982 18 p refs
(CSIR-TWISK-258) Avail: NTIS HC A02/MF A01

The potential use of randomized strategies in water resources planning is critically examined and difficulties related to the implementation of such strategies are discussed. The overall conclusion is that it does not appear likely that water resources planners will accept these types of strategies because of the frequency based approach to probability which is commonly used to interpret probabilistic objects in the water resources context. On the other hand it is possible to use randomized strategies to obtain upper bounds for heuristics designed to generate pure strategies.
Author

N83-36827# Orange Free State Univ., Bloemfontein (South Africa).
PREDICTION IN MULTIVARIATE REGRESSION ANALYSIS
P. C. N. Groenewald, A. J. vanderMerwe, and D. J. deWaal Feb. 1982 13 p refs Sponsored in part by CSIR
(TR-76) Avail: NTIS HC A02/MF A01

The prediction of future observations in the case of multivariate regression was considered. The sample reuse technique is used to derive a shrunken predictor, and the bootstrap is also considered as a means of obtaining a predictor. Results of simulation studies

comparing these predictors with maximum likelihood and other shrunken predictors, Stein and Ridge, are also given. Author

N83-36828# Orange Free State Univ., Bloemfontein (South Africa). Dept. of Mathematical Statistics.
THE NASH SOLUTION IN MULTIPLE BAYESIAN'S DECISION PROBLEMS
D. J. DeWaal Feb. 1982 11 p refs Sponsored by CSIR
(TR-75) Avail: NTIS HC A02/MF A01

The Nash solution is illustrated in a multiple Bayesian's decision problem. Author

N83-36829# Minnesota Univ., Minneapolis. Computerized Adaptive Testing Lab.
BIAS AND INFORMATION OF BAYESIAN ADAPTIVE TESTING
David J. Weiss and James R. McBride Mar. 1983 32 p refs
(Contract N00014-79-C-0172; RR0420401)
(AD-A129280; RR-83-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

The present study was designed to further investigate the nature of the bias and the information characteristics of Owen's Bayesian adaptive testing strategy and to examine possible causes of the bias. Factors investigated included (1) the effects of item discrimination, (2) the effects of fixed vs. variable test length, and (3) the effect of an accurate prior theta estimate. Monte Carlo simulation of Owen's adaptive test was used. GRA

N83-36830# Pennsylvania State Univ., University Park. Dept. of Statistics.
COMPARATIVE NOTCHED BOX PLOTS
Thomas P. Hettsmansperger Jun. 1983 19 p refs
(Contract N00014-80-C-0741)
(AD-A129281; TR-43) Avail: NTIS HC A02/MF A01 CSCL 12/1

Comparative notched box plots are developed to provide confidence intervals and hypothesis tests for the two sample location model. The notches are confidence intervals derived from the sign test. Rules are given for assigning confidence coefficients to the notches to yield a 95 percent confidence interval and 5 percent two sided test for the difference in locations. The test that rejects no location difference when the sign notches are disjoint is shown to be Mood's median test. Circumstances under which multiple comparisons can be carried out are also discussed.
Author (GRA)

N83-36831# Massachusetts Inst. of Tech., Cambridge. Statistics Center.
A LOWER BOUND FOR THE BAYES RISK FOR TESTING SEQUENTIALLY THE SIGN OF THE DRIFT PARAMETER OF A WIENER PROCESS
Ashim Mallik and Yi-Ching Yao Mar. 1983 7 p refs
(Contract N00014-75-C-0555)
(AD-A129231; TR-26-ONR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let x(t) be a Wiener process with drift micron and variance 1 per unit of time. For testing H: micron less than or equal to 0 was A: micron greater than 0 with the loss function (micron) if the wrong decision is made and 0 otherwise, c cost of observation per unit time and micron has a prior distribution which is normal with mean 0 and variance delta sub 0 to the 2nd power, the authors followed an idea of Bickel and Yahav to obtain a lower bound for the Bayes risk and showed that this lower bound is strict as delta sub 0 approaches limit of infinity for all c.
Author (GRA)

N83-36832# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.
ASYMPTOTIC BEHAVIOR OF STOCHASTIC APPROXIMATION AND LARGE DEVIATIONS
Harold J. Kushner Jan. 1983 35 p refs
(Contract N00014-76-C-0279; Grants AF-AFOSR-0116-81; NSF ENG-77-12946; AF Proj. 2304)
(AD-A129209; LCDS-83-1; AFOSR-83-0483TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The theory of large deviations is applied to the study of the asymptotic properties of the stochastic approximation algorithms. The method provides a useful alternative to the currently used technique of obtaining rate of convergence results. GRA

N83-36833# Oregon State Univ., Corvallis. Dept. of Electrical and Computer Engineering.
OPTIMIZATION OF STOCHASTIC DYNAMIC SYSTEM WITH RANDOM COEFFICIENTS
Man Hyung Lee Mar. 1983 113 p refs
(Contract N00014-81-K-0814)
(AD-A129691; OSU-ONR-TR-83-2) Avail: NTIS HC A06/MF A01 CSCL 12/1

The problem of optimization of stochastic dynamic systems with random coefficients is discussed. Systems with both Wiener processes and uncertain random-process disturbances are dealt with, and these include certain bilinear stochastic systems. It is the purpose to study the optimal control and, to some extent, state estimation of such bilinear stochastic systems. By means of the stochastic Bellman equation, the optimal control of stochastic dynamic models with observable and unobservable coefficients is derived. The stochastic-system model considered is the observable system with random coefficients that are a function of the solution of a certain unobservable Markov process with information data. Under the assumptions that the solution of the stochastic differential equation for the dynamic model involved in the problem formulation results in an admissible control and that the measurable information of all random parameters depend on the conditional-mean estimate to the unobservable stochastic process, the optimal control is a linear function of the observable states and a nonlinear function of random parameters. GRA

N83-36834# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
TECHNIQUES FOR MODELING STOCHASTICS DYNAMICAL SYSTEMS Final Report, 4 Feb. 1976 - 1 Jan. 1983
R. W. Brockett 26 May 1983 7 p refs
(Contract DAAG29-79-C-0147; Grant DAAG29-76-G-0139)
(AD-A129674; ARO-13605.14-MA; ARO-16465.3-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report summarizes the principle research findings on 30 published papers and 3 Ph.D. Theses completed with partial support of the Army Research Office. Nonlinear stochastic systems arise in various areas of engineering including communications, vibrations and control. Under the grant and contract referenced above the author undertook to produce rich class models which were, at the same time, analytically tractable. He studied these questions with respect to computing the statistical properties of solutions and with respect to finding sufficient statistics for nonlinear estimation problems. Also investigated were the specific questions which arise in an attempt to adaptively control systems via system identification and subsequent control. GRA

N83-36835# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
WORST-CASE ANALYSES OF SELF-ORGANIZING SEQUENTIAL EARCH HEURISTICS Interim Report
Jon Louis Bentley and Catherine Cole McGeoch 28 Mar. 1983 19 p refs
(Contract N00014-76-C-0370)
(AD-A129665; CMU-CS-83-121) Avail: NTIS HC A02/MF A01 CSCL 12/1

The performance of sequential search can be enhanced by the use of heuristics that move elements closer to the front of the list as they are found. Previous analyses have characterized the performance of such heuristics probabilitically. In this paper we show that the heuristics can also be analyzed in the worst-case sense, and that the relative merit of the heuristics under this analysis is different than in the probabilistic analyses. Simulations show that the relative merit of the heuristics on real data is closer to that of the new worst-case analyses rather than that of the previous probabilistic analyses. Author (GRA)

N83-36836# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON SELECTING THE BEST AMONG GOOD POPULATIONS BASED ON A TWO-STAGE PROCEDURE: A BAYESIAN APPROACH WITH APPLICATIONS
Shanti S. Gupta and Joong K. Sohn Jun. 1983 17 p refs
Presented at the 2nd Valencia Conf. on Bayesian Statistics, Spain, 6-10 Sep. 1983
(Contract N00014-75-C-0455)
(AD-A129446; TR-83-17) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several procedures have been studied to select the best among a set of new treatments (populations) which are better than a standard (or control) using two-stage procedures for the case of normal populations. One such procedure is to select the best based on the confidence intervals with a specified fixed width 2d after eliminating those populations which are worse than the standard based on the expected posterior losses. Several papers deal with this kind of problem but none of them is based on the so-called 100(1-2 alpha)% Highest Posterior Density (HPD) credible regions, which are conceptually equivalent to the confidence intervals, with a fixed width 2d. After retaining good populations based on the expected posterior losses, we set up a stopping rule Ni for constructing the HPD credible region for each selected population, which is asymptotically efficient and consistent. GRA

N83-36837# Florida State Univ., Tallahassee. Dept. of Statistics.
A NON-CLUSTERING PROPERTY OF STATIONARY SEQUENCES
Arif Zaman May 1983 20 p
(Contract DAAG29-82-K-0168)
(AD-A129628; ARO-19367.5-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a random sequence of events, with indicator variables Xi, the behavior of the expectation E((X sub k +...+ K sub k + m-1)/(X sub 1 +...+X sub n)) for 1 < or = k < or = k + m - 1 < or = n can be taken as a measure of clustering of the events. When the measure on the X's is i.i.d., or even exchangeable, a symmetry argument shows that the expectation can be no more than m/n. When the X's are constrained only to a stationary sequence, the bound deteriorates, and depends on k as well. When m/n is small, the bound is roughly 2m/n for k near n/2 and is like (m/n) log n for k near I or n. The proof given is partly constructive, so these bounds are nearly achieved, even though there is room for improvement for other values of k. Author (GRA)

N83-36838# Los Alamos Scientific Lab., N. Mex.
A THIRD MONTE CARLO SAMPLER. REVISION AND EXTENSION OF SAMPLERS 1 AND 2
C. J. Everett and E. D. Cashwell Mar. 1983 152 p refs
(Contract W-7405-eng-36)
(DE83-013361; LA-9721-MS) Avail: NTIS HC A08/MF A01

Methods are given for sampling some standard probability densities by means of machine generated random numbers. The probability theory underlying each device is briefly indicated. The present collection embodies the densities of the first two samplers, and an attempt has been made to render the explanations less terse and more understandable. Some additional methods and new densities have been included. No attempt has been made to quote all original sources, and no claim to priority is intended in any case. DOE

N83-36270# Hokkaido Univ., Sapporo (Japan).
AN ANALYSIS OF A PRT 2-BERTH STATION MODEL BY THE MARKOV CHAIN THEORY
Takashi Nakamura, Masahito Kurihara, and Ijuo Kaji *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 47-58 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N83-36839# Wisconsin Univ., Madison. Mathematics Research Center.
NORMAL SOLUTIONS OF LINEAR PROGRAMS Technical Summary Report
O. L. Mangasarian Mar. 1983 23 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-00632)
(AD-A129073; MRC-TSR-2498) Avail: NTIS HC A02/MF A01 CSCL 12/1

The solvability of a linear program is characterized in terms of the existence of a fixed projection on the feasible region, of all sufficiently large positive multiples of the gradient of the objective function. This projection turns out to be the normal solution obtained by projecting the origin on the optimal solution set. By seeking the solution with least 2-norm which minimizes the 1-norm infeasibility measure of a system of linear inequalities or of the optimality conditions of a linear program one is led to a simple minimization problem of a convex quadratic function on the nonegative orthant which is guaranteed to be solvable by a succesive overrelaxation (SOR) method. This normal solution is an exact solution if the original system is solvable, otherwise it is an error-minimizing solution. New computational results results are given to indicate that SOR methods can solve very large sparse linear programs that cannot be handled by an ordinary linear programming package. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar physics.*

N83-36840# Cape Town Univ. (South Africa). Nonlinear Structural Mechanics Research Unit.
A SURVEY OF INCREMENTAL PROCEDURES IN NONLINEAR MECHANICS
D. L. Hawla and J. B. Martin Dec. 1981 36 p refs
(TR-12) Avail: NTIS HC A03/MF A01

The most effective method of solution of the equations arising in the finite element formulation of problems in nonlinear structural mechanics is an incremental procedure used together with an iterative improvement scheme. The paper attempts to provide a critical survey of methods in current use, with emphasis on those methods which are most effective. Time integration schemes for dynamic response analysis are described, with particular emphasis on Newmark's trapezoidal rule. A parallel description of incremental loading procedures for static analysis is also given. Whenever these schemes are used either static or dynamic analysis, it is necessary to use an iterative improvement scheme to ensure that the equilibrium or dynamic equations are satisfied at each step. The most important of these schemes are those based on the Newton-Raphson method as applied to systems of equations, and in view of this Newton-Raphson and modified Newton-Raphson methods are described first. It is then shown that the other related methods can be regarded as accelerating schemes for the Newton-Raphson method. Examples which demonstrates the effectiveness of the methods are presented. Author

N83-36841# Office of Naval Research, London (England).
THE 29TH INTERNATIONAL FIELD EMISSION SYMPOSIUM
T. E. Feuchtwang (Pennsylvania State Univ.) 28 Apr. 1983 10 p Symp. held at Goeteborg, 9-13 Aug. 1982
(AD-A130894; ONRL-C-6-83) Avail: NTIS HC A02/MF A01 CSCL 05/1

The symposium consisted of 14 sessions and two workshops. The topics indicated the maturing of field emission, the shifting emphasis from the physics of the emission process to the study of specific devices, and the use of the process for applications such as probing of surfaces, corrosion, and alloys. Relatively large blocks of time were devoted to discussing two topics currently exciting great interest in the field: liquid metal ion sources (three sessions and one workshop), and the pulsed laser atom probe (one session and one workshop). An annotated list of the papers presented at the symposium is given. GRA

N83-36842# Air Force Geophysics Lab., Hanscom AFB, Mass. Aeronomy Div.
THEORY OF SPACE CHARGE BETWEEN PARALLEL PLANE ELECTRODES Scientific Interim Report
Christopher Sherman 12 Dec. 1982 39 p refs
(AF Proj. 7661)
(AD-A129310; AFGL-TR-82-0385; AFGL-PSRP-664) Avail: NTIS HC A03/MF A01 CSCL 12/1

The theory of space charge between parallel plane electrodes is treated as a boundary value problem. This treatment leads in a natural way to the organization and classification of the many-valued solutions to this problem. Author (GRA)

N83-36843# Edinburgh Univ. (Scotland). Dept. of Physics.
DISORDER, RANDOM FIELDS AND COMPETING INTERACTIONS IN ANTIFERROMAGNETS
R. A. Cowley, R. J. Bigenau (MIT), G. Shirane (BNL), and H. Yoshizawa (BNL) 1983 30 p refs Presented at the NATO Advanced Study Institute Conf. on Multicritical Phenomena in Phys., Gielo, Norway, 10 Apr. 1983
(Contract DE-AC02-76CH-00016)
(DE83-015578; BNL-33337; CONF-8304108-1) Avail: NTIS HC A03/MF A01

Neutron scattering studies of disordered antiferromagnets proved a very profitable way of studying random systems. Several recent examples are selected and include a detailed study of the phase transition of a $d = 3$ Ising system showing a well defined transition with properties different from these of a pure $d = 3$ Ising system. The effect of a random field on the ordering and phase transitions is stressed. Random fields do have a large effect on the critical properties and in practice destroy the long range order in the good Ising systems with $d = 2$ and $d = 3$, although not in a nearly Heisenberg-like system. These results are compared with current theories and the discrepancies discussed. Finally measurements on a system with competing interactions are discussed and shown to be strongly influenced by the random fields produced in that system. DOE

N83-36844# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS, NO. 85
26 Sep. 1983 39 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84411) Avail: NTIS HC A03

This serial report contains news items, abstracts and articles of scientific reports on aspects of physics and mathematics including semiconductors, permittivity, lasers, masers, nuclear physics, optics, spectroscopy, optoelectronics, and plasma physics. For individual titles, see N83-36845 through N83-36845.

N83-36845# Joint Publications Research Service, Arlington, Va.
DISCHARGE-PUMPED HIGH PULSE EXCIMER LASER c36
A. Vill, T. Klementi, V. Mikhkelsoo, and V. Altukhov *In its* USSR Rept.: Phys. and Math., No. 85 (JPRS-84411) 26 Sep. 1983 p 6-12 refs Transl. into ENGLISH from Izv. Akad. Nauk Estonskoy SSR: Fiz. Mat. (Tallin), v. 32, no. 1, Jan. - Mar. 1983 p 109-113
(For primary document see N83-36844 24-70)
Avail: NTIS HC A03

A discharge-pumped repetitively pulsed excimer laser was developed whose efficiency is about 1%. At a pulse repetition rate of 100 Hz, and pulse energies of 75 mJ and 100 mJ were achieved for XeCl XeF, respectively. The pulse power and pulse energy of the XeF and XeCl lasers generating at wavelengths of 350 and 308 nm, respectively, are plotted as a function of the laser mixture composition and pressure.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N83-36846* National Aeronautics and Space Administration. Pasadena Office, Calif.
ACOUSTIC SUSPENSION SYSTEM Patent
Mark C. Lee (JPL, California Inst. of Tech., Pasadena) and Taylor G. Wang, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 6 Sep. 1983 7 p Filed 12 Jun. 1981 Supersedes N81-27887 (19 - 18, p 2545) Sponsored by NASA
(NASA-Case-NPO-15435-1; US-Patent-4,402,221; US-Patent-Appl-SN-272837; US-Patent-Class-73-505; US-Patent-Class-308-10) Avail: US Patent and Trademark Office CSCL 20A

An acoustic levitation system is described, with single acoustic source and a small reflector to stably levitate a small object while the object is processed as by coating or heating it. The system includes a concave acoustic source which has locations on opposite sides of its axis that vibrate towards and away from a focal point to generate a converging acoustic field. A small reflector is located near the focal point, and preferably slightly beyond it, to create an intense acoustic field that stably spports a small object near the reflector. The reflector is located about one-half wavelength from the focal point and is concavely curved to a radius of curvature (L) of about one-half the wavelength, to stably spport an object one-quarter wavelength (N) from the reflector.
Official Gazette of the U.S. Patent and Trademark Office

N83-36847*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH TEMPERATURE ACOUSTIC LEVITATOR Patent Application
Martin B. Barmatz, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Aug. 1983 19 p
(Contract NAS7-100)
(NASA-Case-NPO-16022-1; US-Patent-Appl-SN-526750) Avail: NTIS HC A02/MF A01 CSCL 20A

Acoustical levitation of an object within a portion of a chamber is heated to a high temperature, while a driver at the opposite end of the chamber is maintained at a relatively low temperature. The cold end of the chamber is constructed so it is telescoped to vary its length and the entire chamber. The chamber remains resonant to a normal mode frequency, and the pressure at the hot end of the chamber is maximized. The precise length of the chamber at any given time, is maintained at an optimum resonant length by a feedback loop. The feedback loop includes an acoustic pressure sensor at the hot end of the chamber. The output is delivered to a control circuit of the motor that varies the length of the chamber to a level where the sensed acoustic pressure is a maximum. Author

N83-36848# Army Construction Engineering Research Lab., Champaign, Ill. Environmental Div.
SOUND POWER MEASUREMENTS ON THE M1E1 ENGINE AND TOTAL POWER PACK Final Report
Paul D. Schomer May 1983 34 p
(Contract IAO-82065)
(AD-A128989; CERL-TR-N-150) Avail: NTIS HC A03/MF A01 CSCL 19/3

A new technique to measure power was used to gather

one-third octave emissions data on the M1E1 engine (AGT 1500) at the Stratford Army Engine Plant, CT and on the M1E1 power pack at Aberdeen Proving Ground, MD. To calculate sound power, acoustic intensity (the product of the scaler pressure and the vector velocity) was measured and integrated over an arbitrary surface enclosing the source. The data gathered and test results show this new technique is very powerful and robust and is applicable to many machinery quieting, source emission, or sound transmission measurements. Author (GRA)

N83-36849# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.

HELICOPTER NOISE SURVEY AT SELECTED NEW YORK CITY HELIPORTS

E. J. Rickley, M. J. Brien, and Steven R. Albersheim Mar. 1983 78 p Prepared in cooperation with Transportation Systems Center, Cambridge, Mass.

(AD-A129167; FAA-EE-83-2) Avail: NTIS HC A05/MF A01 CSCL 20/1

The FAA conducted a noise measurement survey of helicopter operations at three principal heliports in the borough of Manhattan in New York City on November 16-17, 1982. The purpose was to gather needed information for defining noise problems with in-service helicopter operations within urban areas. These noise data will be used to further define the environmental problems associated with helicopter operations in urban areas. Statistical community noise level data, measured over an 8-hour period at each selected site, are provided which reflect the noise levels at these sites from all local sources during that particular day. Noise data from individual helicopter operations are also provided. These data from helicopter targets of opportunity are termed survey data as opposed to controlled test data in order to reflect the limited control over factors which contribute to the variability of the measured noise level. Noise data are presented for the Augusta A-109, Bell 47J, Bell 206L, Bell 222, Boelkow B-105, and Sikorsky S-76. Author (GRA)

N83-36850# Naval Research Lab., Washington, D. C. Applied Optics Branch.

ACOUSTO-OPTIC FOURIER TRANSFORM DEVICES FOR SURVEILLANCE SIGNAL PROCESSING Interim Report, 10 Feb. - 30 Sep. 1982

John N. Lee, S. C. Lin, and A. B. Tveten 30 Jun. 1983 41 p refs

(WF151710)

(AD-A129803; NRL-MR-5113) Avail: NTIS HC A03/MF A01 CSCL 12/1

Acousto-optic techniques have been investigated for application to the Fourier-transform requirements of the Gemini surveillance concept. Acousto-optical computation of continuous and discrete Fourier transforms have been performed using a time-integrating architecture. Time-integration in conjunction with diode lasers and bulk optics can be used to produce inherently compact optical systems, and several compact processor concepts have been demonstrated. Performance parameters and tradeoffs have been analyzed for these processors, and present device limitations identified. 30 dB dynamic range has been demonstrated. Additional concepts for miniaturization, including application of integrated optics, are discussed. Multichannel operation will be required in Gemini, and the Fourier-transform devices developed here have been shown to be easily adaptable to multichannel operation. Two-channel operation has been demonstrated; several multichannel concepts have been evaluated, and one design is being implemented. Author (GRA)

N83-36851# Pennsylvania State Univ., University Park. Lab. for Applied Research.

ROTOR NOISE DUE TO BLADE-TURBULENCE INTERACTION Ph.D. Thesis

Kiyoto Ishimaru 25 Jan. 1983 107 p refs

(Contract N00024-79-C-6043)

(AD-A129757; ARL/PSU/TM-83-27) Avail: NTIS HC A06/MF A01 CSCL 20/1

The time-averaged intensity density function of the acoustic radiation from rotating blades is derived by replacing blades with rotating dipoles. This derivation is done under the following turbulent inflow conditions: turbulent ingestion with no inlet strut wakes, inflow turbulence elongation and contraction with no inlet strut wakes, and inlet strut wakes. Dimensional analysis reveals two non-dimensional parameters which play important roles in generating the blade-passing frequency tone and its multiples. The elongation and contraction of inflow turbulence has a strong effect on the generation of the blade-passing frequency tone and its multiples. Increasing the number of rotor blades widens the peak at the blade-passing frequency and its multiples. Increasing the rotational speed widens the peak under the condition that the non-dimensional parameter involving the rotational speed is fixed. The number of struts and blades should be chosen so that (the least common multiple of them)-(rotational speed) is in the cutoff range of Sears' function, in order to minimize the effect of the mean flow deficit on the time averaged intensity density function. GRA

N83-36852# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.

THE C-9A INTERIOR NOISE EVALUATION Final Report, 28 Apr. - 2 May 1982

Carolyn M. Jones Feb. 1983 25 p refs

(AD-A129256; OEHL-83-101EH174BNA) Avail: NTIS HC A02/MF A01 CSCL 20/1

The USAF OEHL was requested by HQ MAC/SGPE to evaluate interior noise levels on the C-9A Nightingale aircraft during aeromedical evacuation operations because of subjective opinion that the cabin has become more noisy in recent years. Measurements were made on 18 regular working flights of the 57th Aeromedical Evacuation Squadron (AES), Scott AFB IL. Noise exposure data indicated hazardous noise levels in the rear of the cabin only. Crew-member noise exposures could be effectively limited by the use of hearing protection. Author (GRA)

N83-36853# Naval Research Lab., Washington, D. C. Underwater Sound Reference Detachment.

NONLINEAR SCATTERING OF ACOUSTIC WAVES BY VIBRATING OBSTACLES Ph.D. Thesis Stevens Inst. of Technology

Jean C. Piquette 1 Jun. 1983 168 p refs

(RR0110842)

(AD-A129282; NRL-MR-5077) Avail: NTIS HC A08/MF A01 CSCL 20/1

The problem of the generation of sum- and difference-frequency waves produced via the scattering of an acoustic wave by an obstacle whose surface vibrates harmonically was studied both theoretically and experimentally. The theoretical approach involved solving the nonlinear wave equation, subject to appropriate boundary conditions, by the use of a perturbation expansion of the fields and a Green's function method. In addition to ordinary rigid-body scattering, Censor predicted nongrowing waves at frequencies equal to the sum and to the difference of the frequencies of the primary waves. The solution to the nonlinear wave equation also yields scattered waves at the sum and difference frequencies. However, the nonlinearity of the medium causes these waves to grow with increasing distance from the scatter's surface and, after a very small distance, dominate those predicted by Censor. The simple-source formulation of the second-order nonlinear wave equation for a lossless fluid medium has been derived for arbitrary primary wave fields. This equation was used to solve the problem of nonlinear scattering of acoustic waves by a vibrating obstacle for three geometries: (1) a plane-wave scattering by a vibrating plane, (2) cylindrical-wave scattering by a vibrating cylinder, and (3) plane-wave scattering by a vibrating cylinder. Successful experimental validation of the theory was inhibited by previously unexpected levels of nonlinearity in the hydrophones used. Such high levels of hydrophone nonlinearity appeared in hydrophones that, by their geometry of construction, were expected to be fairly linear. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N83-36854# Pittsburgh Univ., Pa. Dept. of Physics.
THEORETICAL STUDIES OF ELECTRON CONDUCTION THROUGH ATTACHING GASES Interim Report, 1 Jul. 1982 - 31 May 1983
J. N. Bardsley 31 May 1983 4 p
(Contract N00014-82-C-0021)
(AD-A129064) Avail: NTIS HC A02/MF A01 CSCL 20/8

The motion of electrons in gases containing a mixture of moderating and attaching molecules is explored through Monte Carlo simulations. The results are used to check analytic theories based on the Boltzmann equation. Applications are made to transient problems associated with the pulsed power program. The possibility of fast operation of a diffuse discharge opening switch has been demonstrated, through the study of simple models. More detailed analyses of spatial and temporal inhomogeneities are underway. The basic atomic physics data necessary for these studies are obtained by semi-empirical calculations and analyses of laboratory measurements. Author (GRA)

N83-36855# Florida Univ., Gainesville. Quantum Theory Project.
MOLECULAR INTERACTIONS WITH MANY-BODY METHODS Annual Technical Report
Rodney J. Bartlett 30 Dec. 1982 46 p refs
(Grant AF-AFOSR-0026-82; AF Proj. 2301)
(AD-A130040; AFOSR-83-0551TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Modern military technology has become highly dependent on a detailed knowledge of atom-molecule and molecule-molecule interactions. This type of information is required in diverse defense applications including chemical laser development, in the detection and modeling of plumes, and in the decomposition of energetic materials. The description of forces governing molecular reactions is provided by potential energy surfaces. These surfaces are the crucial first step in dynamics calculations that provide required information about state-to-state cross-sections and rate constants. Since potential energy surfaces are not generally available from experiment, the most reliable approach to their determination lies in the development and application of predictive ab initio quantum mechanical methods. The following annual report describes our research on the development of many-body perturbation theory (MBPT) and related infinite-order coupled-cluster (CC) methods for potential energy surfaces. GRA

N83-36856# Visidyne, Inc., Burlington, Mass.
ROCKET-BORNE POSITIVE AND NEUTRAL BEAM EXPERIMENTAL PLAN Final Report, 1 Jul. 1979 - 30 Sep. 1982
J. W. Carpenter and C. H. Humphrey Hanscom AFB, Mass. Air Force Geophysics Lab. Jan. 1983 33 p
(Contract F19628-79-C-0109; AF Proj. ILIR)
(AD-A130121; VI-667; AFGL-TR-83-0025) Avail: NTIS HC A03/MF A01 CSCL 20/8

In this report the design of a rocket-borne charge ejection payload consisting of proton and neutral hydrogen beams is presented. The experimental plan calls for beams to be emitted up, down, and perpendicular to the geomagnetic field to be intercepted by throw-away detectors (TADS). This experimental plan is designed to be very cost effective, while extending the present upper limit of heavy charged beams to higher levels and revealing significant scientific information. Author (GRA)

N83-36857# Mission Research Corp., Albuquerque, N. Mex.
HIGH CURRENT BETATRON STABILITY AND INJECTION STUDIES
T. P. Hughes, B. B. Godfrey, and M. M. Campbell 1983 11 p refs Presented at the Navy CPB Tech. Rev., Naval Surface Weapons Center, 17-18 May 1983
(Contract N00014-81-C-0647)
(AD-A130127; AMRC-N-230) Avail: NTIS HC A02/MF A01 CSCL 20/7

MRC Contributing in Several Areas of High Current Cyclic Induction Accelerator Research: (1) Linear Theory of Negative Mass and Resistive, Wall Instabilities in Modified Betatron, (2) Linear Theory of Beam Breakup Instability in Recirculating Induction Accelerator, (3) Single-Turn Injection Simulation for Modified Betatron, (4) Multi-Turn Injection Simulation for Conventional Betatron, and (5) Negative Mass Instability Saturation Simulation. Presentation reviews negative mass saturation, negative mass linear theory, multi-turn injection. GRA

N83-36858# Mission Research Corp., Albuquerque, N. Mex.
BEAM BREAKUP INSTABILITIES IN HIGH CURRENT ELECTRON BEAM RACETRACK INDUCTION ACCELERATORS
Brendan B. Godfrey and Thomas P. Hughes 22 Apr. 1983 33 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract N00014-81-C-0647)
(AD-A130149; AMRC-R-469) Avail: NTIS HC A03/MF A01 CSCL 20/7

Beam breakup and negative mass instability growth rates for a 1 kA, 40 MeV electron beam racetrack induction accelerator are computed. The device is taken to have four accleration gaps, each with 0.2 MeV applied voltage and 15 ohm transverse impedence; the guide field is 2 kg. We find that the total amplification of the beam breakup mode is limited to five e-findings provided that the cavity mode quality factor Q is 6. Thus, the negative mass instability, which grows several times faster, is the dominant consideration. However, we also find that they energy range over which the negative mass instability occurs can be narrowed substantially by reducing the guide field strength after the beam has been accelerated to about 12 MeV. This approach, coupled with beam thermal effects, not considerated here, probably is sufficient to limit negative mass growth to acceptable levels in the racetrack accelerator. Author (GRA)

N83-36859# Georgia State Univ., Atlanta.
INVESTIGATIONS OF THE INTERACTIONS OF RADIATION WITH MATTER Final Report, Jan. 1980 - Feb. 1983
Steven T. Manson 31 May 1983 11 p refs
(Contract DAAG29-80-C-0027)
(AD-A129980; ARO-16853.2-PH) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work on the interaction of radiation with matter is described. In particular photoabsorption by ions and excited states is discussed, along with relativistic effects in the photoabsorption by heavy elements and charged particle impact ionization of atoms. The relevance of these areas to various applied areas such as radiation protection and safety, X-ray laser schemes and effects, nuclear pumped lasers, and IR detection is pointed out. Author (GRA)

N83-36860# State Univ. of New York, Albany. Dept. of Physics.
ATOMIC STRUCTURE STUDIES OF SEMICONDUCTOR-ELECTROLYTE, METAL AND VACUUM INTERFACES Annual Report
Walter M. Gibson and J. O. Dimmock 12 Jan. 1982 12 p refs
(Contract N00014-78-C-0616; NR Proj. 373-039)
(AD-A129762) Avail: NTIS HC A02/MF A01 CSCL 20/7

The ONR supported surface and interface structure program has two major parts: (1) ion channeling studies of surfaces and interfaces under Ultra High Vacuum (UHV) controlled conditions and (2) X-Ray Standing Wave Studies under non-UHV conditions. The ion scattering program has been particularly productive during this period following a three year period of development, training and constructing. A large number of publications and conference presentations was made and reprints for a number of these are attached so only the highlights of these studies will be mentioned. Author

N83-36861# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.

SEQUENTIAL EXCITATION PREPARATION OF MOLECULAR ENERGY LEVELS WITH SPECIAL STRUCTURAL AND CHEMICAL PROPERTIES Final Report, 1 Sep. 1981 - 30 Sep. 1982
Robert W. Field and James L. Kinsey 30 Sep. 1983 8 p refs
(Grant AF-AFOSR-0254-80; AF Proj. 2303)
(AD-A129307; AFOSR-83-0451TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Three types of experiments are discussed. Stimulated Emission Pumping (SEP) on H2CO, Modulated Gain Spectroscopy (MGS) on Na2, and sub-Doppler spectroscopy of the Ca+O3 flame. The SEP experiments have reached the intensive data-generation stage. With 10,000 of vibrational excitation, H2CO is shown to behave as a normal mode oscillator in low rotational levels, but exhibits extensive Coriolis mode mixing in J approx. greater than 10, Ka approx. greater than 4 rotational levels. A laser-locking scheme has improved the sensitivity of MGS by a factor of 1000. A new but puzzling assignment has been made of the Ca + 1000 flame orange band system. GRA

N83-36862# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
SUMMARY OF WORK ON 'COOLED ION FREQUENCY STANDARD', FISCAL YEAR 1983 Annual Report, Oct. 1982 - Sep. 1983
D. J. Wineland and Wayne M. Itano 25 Jun. 1983 14 p refs
(Contract N00014-83-F-0003; NR Proj. 407-004)
(AD-A129339) Avail: NTIS HC A02/MF A01 CSCL 07/4

The purpose of this work is to develop techniques to overcome the fundamental limits of present frequency standards: the second and residual first-order Doppler shifts. To this end, suitable frequency reference transitions in ions which are stored in electromagnetic traps and cooled by radiation pressure to less than 1K were studied. GRA

N83-36863# Brown Univ., Providence, R. I. Dept. of Chemistry.
RAMAN SPECTROSCOPIC STUDY OF MOLECULAR ORIENTATION IN AgTCNQ THIN FILMS
Efstratios Kamitsos and William M. Risen, Jr. 18 Feb. 1983 35 p refs Submitted for publication
(Contract N00014-75-C-0883; NR Proj. 051-539)
(AD-A130438; TR-83-01) Avail: NTIS HC A03/MF A01 CSCL 07/4

Preferential orientation of TCNQ(-) units in thin AgTCNQ films, which were prepared by thermal treatment of vapor-deposited materials on various substrates, is demonstrated by laser Raman spectroscopy. The polarization dependence of Raman intensities in four scattering arrangements have been obtained by varying the polarization direction of the incident light. The experimental results for Raman intensities as a function of substrate orientation are compared with those predicted for films with TCNQ(-) units with various postulated types of orientation relative to the substrate and to each other, and also compared with those obtained from AgTCNQ solution. The data show that AgTCNQ thin films are characterized by preferred orientation of the TCNQ(-) units relative to the substrate at an angle theta approx. or equal to 45 degrees. The lack of other orientation in the sampled region is taken to indicate that there are many relatively small domains, within each of which theta approx. or equal to 45 degrees, which are not oriented with respect to each other. Author (GRA)

N83-36864# Evans (Charles) and Associates, San Mateo, Calif.
DEVELOPMENT AND APPLICATION OF SIMS (SECONDARY ION MASS SPECTROMETRY) CHARACTERIZATION TECHNIQUES FOR THE STUDY OF IMPURITIES AND IMPURITY MOTION IN HgCdTe AND CdTe Semiannual Technical Report, 1 Nov. 1982 - 1 May 1983
Charles A. Evans, Jr. 1 May 1983 10 p refs
(Contract MDA903-82-C-0427; ARPA Order 4606)
(AD-A129223) Avail: NTIS HC A02/MF A01 CSCL 20/7

The broad objectives of this program are to develop quantitative analytical procedures for the application of high performance Secondary Ion Mass Spectrometry (SIMS) to the analysis of CdTe and (HgCd)Te for trace element and major constituent characterization, particularly Hg, and to perform materials- directed research in order to better understand the incorporation and redistribution of impurity elements in CdTe and (HgCd)Te. GRA

N83-36865# Argonne National Lab., Ill.
TRIPLY DIFFERENTIAL STUDIES . OF ATOMIC AND MOLECULAR PHOTOIONIZATION USING SYCHROTRON RADIATION Annual Summary Report
J. L. Dehmer, Albert C. Parr (NBS, Washington, D.C.), and Roger Stockbauer (NBS, Washington, D.C.) 15 Jun. 1983 15 p
(Contract N00014-83-F-0005; NR Proj. 393-051)
(AD-A129184) Avail: NTIS HC A02/MF A01 CSCL 07/4

Basic studies of the dynamics and spectroscopy of atomic and molecular photoionization have been carried out using three experimental probes. The first and most extensively used experimental approach involves triply differential (differential in incident wavelength, electron energy, and ejection angle) photoelectron measurements using synchrotron radiation. Measurements were conducted in the vacuum ultraviolet wavelength range up to h approx = 35 eV on a large variety of atomic and molecular systems. Photoelectron branching ratios and angular distributions were obtained for all accessible states. A major emphasis of this work involved the initial exploration of novel effects of autionization and shape resonances on alternative vibrational ionization channels. The second experimental approach entails measuring the polarization of fluorescence folowing production of excited molecular ions by photionization. This experiment allowed the direct measurement of the alignment of molecular ions produced by photoionization and, simultaneously, the branching ratios for degenerate photoelectron channels. New spectroscopic information can also be obtained in this way. The third experimental approach involves measuring photoelectrons in coincidence with photoions. GRA

N83-36866# IBM Research Lab., San Jose, Calif.
NUCLEAR MAGNETIC RELAXATION IN POLYACETYLENE
J. C. Scott and T. C. Clarke 7 Apr. 1983 9 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A129572; TR-11) Avail: NTIS HC A02/MF A01 CSCL 07/3

Nuclear spin-lattice relaxation rates for 1H and 13C in polyacetylene cannot be adequately explained in terms of either nuclear spin diffusion to a static paramagnetic defect or rapid one-dimensional diffusion of the defect itself. We propose a model in which only a small fraction of the molecular chains contain defects. Nuclei on these chains are rapidly relaxed, while the remainder achieve equilibrium by nuclear spin diffusion. The dependences of the measured relaxation rates upon frequency and isotopic concentration are in agreement with the predictions of this model. GRA

N83-36867# National Bureau of Standards, Boulder, Colo. Quantum Physics Div.
ELECTRON EXCITATION OF FREE-FREE RADIATION IN ARGON AND OF VIBRATIONAL STATES OF H2, D2 AND O2 Final Report, Oct. 1981 - Sep. 1982
A. V. Phelps and S. J. Buckman Wright-Patterson AFB, Ohio AFWAL Apr. 1983 39 p refs
(Contracts MIPR-FY1455-81-00626; MIPR-FY1455-82-N0604; AF Proj. 2301)
(AD-A129418; AFWAL-TR-83-2018) Avail: NTIS HC A03/MF A01 CSCL 20/7

Final measurements are reported for the production of free-free emission by low energy electrons in argon. Absolute intensity measurements were made at 500, 650 and 1300 nm. The electric field to gas density ratio was varied from 0.25 to 10 x 10 to the minus 21st power Vm2 corresponding to mean electron energies from 1.2 to 5.4 eV. The experimental results agree well with theoretical values calculated from cross sections for momentum transfer collisions determined by other techniques. Measurements of vibrational excitation of O2, H2 and D2 were initiated using the collisional transfer of energy from a homonuclear molecule to a

heteronuclear molecule, i.e. CS2 for O2 and CO2 or CO for H2 and D2. Signals were observed using D2 and CO2. GRA

N83-36868# Mound Lab., Miamisburg, Ohio.
CALCULATION OF THE EFFECTS OF NONSPHERICAL MOLECULES ON THE PROPERTIES OF HYDROGEN ISOTOPES. PART 1: PARA-ORTHO COLLISIONS
Michael J. Cavagnero (Chicago Univ., Ill.), Jonathan H. Luke (Chicago Univ., Ill.), and George T. McConville 3 Jun. 1983 48 p refs
(Contract DE-AC04-76DP-00053)
(DE83-013617; MLM-3070) Avail: NTIS HC A03/MF A01

The formalism is set up for obtaining phase shifts and cross sections from the numerical solution of coupled Schroedinger equations using an angle dependent potential function in combination with a physically realistic radial potential function. The resulting computer code is then used to calculate the spherical J = 0, J = 0 case for comparison to previous results and to calculate the J = 0, J = 1 ortho-para case. The results are compared with the spherical potential of McConville and the ortho-para calculations of Niblett and Takayanagi. DOE

N83-36869# Stanford Linear Accelerator Center, Calif.
UPDATE ON THE HIGH-CURRENT INJECTOR FOR THE STANFORD LINEAR COLLIDER
M. B. James, J. E. Clendenin, S. D. Ecklund, R. H. Miller, J. C. Sheppard, C. K. Sinclair, and J. Sodja Mar. 1983 4 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC03-87SF-00515)
(DE83-013107; SLAC-PUB-3085; CONF-830311-169) Avail: NTIS HC A02/MF A01

The high current injector is operational. There are two crucial areas where improvements must be made to meet collider specifications: while the injector can produce up to 10(11) e(+) in a single S-band bucket, initially much of this charge was captured in a low energy tail and was this not suitable for transport through the accelerator and injection into the damping ring. Pulse to pulse position jitter was observed, resulting in transverse wake field which increases beam emittance. The problems described above contribute to substantial current loss during transport from the injector (40 MeV) to the SLC damping ring (1.2 GeV). Experimental studies are continuing with the aim of understanding and improving beam characteristics including bunch length, pulse to pulse stability and emittance. The present status of these studies is reported. DOE

N83-36870# Oak Ridge National Lab., Tenn.
MOLECULAR DEGREES OF FREEDOM: RESONANCES AND ORBITING
D. Shapira and K. A. Erb 1983 24 p refs Presented at the Conf. on Nucl. Phys. with Heavy Ions, Stony Brook, N.Y., 14-16 Apr. 1983
(Contract W-7405-eng-26)
(DE83-012355; CONF-830469-5) Avail: NTIS HC A02/MF A01

Studies of orbiting and other gross features of heavy ion induced reactions show that molecular degrees of freedom play a significant role. The formation of a rotating dinuclear molecule appears as a general feature, and the radii derived for these dinuclear systems are larger than the radii of the conventional nucleus-nucleus potential. These large radii for the molecular bonding potential are similar to those derived from systematic studies performed recently on resonances in the (12)C + (12)C + (16)O systems. DOE

N83-36871# Stanford Linear Accelerator Center, Calif.
CONTROL OF MACHINE FUNCTIONS OR TRANSPORT SYSTEMS
M. D. Woodley, M. J. Lee, J. Jaeger, and A. S. King 1983 3 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-011848; SLAC-PUB-3086; CONF-830311-155) Avail: NTIS HC A02/MF A01

A computer code, COMFORT, was developed at SLAC for on-line calculation of the strengths of magnetic elements in an electron storage ring or transport beam line, subject to first order fitting constraints on the ring or beam line parameters. This code can also be used off-line as an interactive lattice or beam line design tool. DOE

N83-36872# Stanford Linear Accelerator Center, Calif.
MEASUREMENT AND SIMULATION OF THE DRIFT PULSES AND RESOLUTION IN THE MICRO-JET CHAMBER
J. Vavra Jan. 1983 16 p refs Presented at the Wire Chamber Conf., Vienna, 15 Feb. 1983
(Contract DE-AC03-76SF-00515)
(DE83-012334; SLAC-PUB-3045; CONF-830223-5) Avail: NTIS HC A02/MF A01

A prototype of a micro-jet chamber, using both a nitrogen laser and a 10 GeV electron beam was tested. The achieved resolution in the particle beam was sigma + 18(SIGMA)m for a 1 mm impact parameter and 22(SIGMA)m when averaging over the entire beam profile. The experimental results were compared to a Monte Carlo program which simulates the pulse shapes and resolution in drift chambers of any geometry. The main emphasis in our simulation analysis was to study various strategies for drift chambers in order to achieve the best possible timing resolution. DOE

N83-36873# Stanford Linear Accelerator Center, Calif.
BEAM-SHAPE DISTORTION CAUSED BY TRANSVERSE WAKE FIELDS
A. W. Chao and S. Kheifets Feb. 1983 3 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-012713; SLAC-PUB-3052; CONF-830311-142) Avail: NTIS HC A02/MF A01

As a particle bunch in a storage ring passes through a region with a transverse impedance, it generates a transverse wake electromagnetic field that is proportional to the transverse displacement of the bunch in the region. The field acts back on the bunch, causing various effects (such as instabilities) in the motion of the bunch. One such effect in which a transverse impedance causes the beam to be distorted in its shape was studied. Observed at a fixed location in the storage ring, this distortion does not change from turn to turn; rather, the distortion is static in time. To describe the distortion, the bunch is considered to be divided longitudinally into many slices and the centers of change of the slices are connected into a curve. In the absence of transverse impedance, this curve is a straight line parallel to the direction of motion of the bunch. Perturbed by the transverse wake field, the curve becomes distorted. DOE

N83-36874# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.
POLARIMETERS FOR THE AGS POLARIZED-PROTON BEAM
D. G. Crabb, B. Bonner, J. Buchanan, J. A. Bywater, P. R. Cameron, M. Fujisaki, M. E. Hejazifar, A. D. Krisch, S. L. Linn, and A. Perlmutter 1983 3 p ref Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983 Prepared in cooperation with Michigan Univ., Ann Arbor; LASL; Rice Univ., Houston; ANL
(Contract DE-AC02-76CH-00016)
(DE83-012229; BNL-32780; CONF-830311-151) Avail: NTIS HC A02/MF A01

The three polarimeters which will be used to measure the beam polarization at the AGS polarized beam facility are described. The beam polarization will be measured before injection into the AGS, during acceleration, and after extraction from the AGS. The 200 MeV polarimeter uses scintillation-counter telescopes to measure the asymmetry in p-caron inclusive scattering. The internal polarimeter can measure the beam polarization at up to five selected times during acceleration. A continuously spooled nylon filament is swung into the beam at the appropriate time and the asymmetry in pp elastic scattering measured by two scintillation-counter telescopes. This is a relative polarimeter which is calibrated

by the absolute external polarimeter located in the D extracted-beam line. This polarimeter uses scintillation counters in two double-arm magnetic spectrometers to measure clearly the asymmetry in pp elastic scattering from a liquid hydrogen target. The specific features and operation of each polarimeter will be discussed. DOE

N83-36875# Fermi National Accelerator Lab., Batavia, Ill.
HADRON-HADRON ELASTIC SCATTERING AT LARGE MOMENTUM TRANSFERS
Roy Rubinstein May 1983 14 p refs Presented at the Am. Phys. Soc. Spring Meeting, Baltimore, 18 Apr. 1983
(Contract DE-AC02-76CH-03000)
(DE83-012772; FERMILAB-Conf-83/50-EXP; CONF-830463-2) Avail: NTIS HC A02/MF A01

Cross sections for (LC OMEGA) (+)p, K(+)p and p(+)p elastic scattering for incident momenta above a few tens of GeV/c and momentum transfers in the range 1 less than of equal to -t less than or equal to 10 (GeV/c) (2) have recently been measured. The data are reviewed, and compared with existing models of elastic scattering. DOE

N83-36876# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
AUTOMATIC TUNING OF THE LBL SUPERHILAC THIRD-INJECTOR TRANSPORT LINE
Howard Pines Mar. 1983 6 p refs Presented at the Particle Accelerator Conf. on Accelerator, Eng. and Technol., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00098)
(DE83-012901; LBL-15209; CONF-830311-163) Avail: NTIS HC A02/MF A01

Testing of a new automatic tuning procedure in an LBL SuperHILAC beam transport line was conducted with the third injector microcomputer control system. This technique is an advance over the sequential station-by-station automatic tuning method developed for the Bevalac transfer line. The computer now performs steering/focusing adjustments simultaneously on a number of quadrupole and dipole magnets comprising multiple-station sections of the injection line. New magnet currents are computed from equations governing beam optics in a real time simulation of the beam line. The key to this emittance utilizes the same control magnets and beam profile monitors used for manual tuning of the line. This emittance calculation requires high resolution beam profile measurements using multi-wire profile monitors recently installed in the third injector line. DOE

N83-36877# Fermi National Accelerator Lab., Batavia, Ill.
A DETERMINATION OF INTRINSIC TRANSVERSE MOMENTUM OF QUARKS
P. K. Malhotra and R. Orava Nov. 1982 7 p refs
(Contract DE-AC02-76CH-03000)
(DE83-000688; FERMILAB-Pub-82/80) Avail: NTIS HC A02/MF A01

It is suggested that the observed universality of the transverse momentum squared distribution for the meson resonances eta, rho, omega f and K* in soft hadron-hadron interactions arises because they are dominantly produced as a result of quark-antiquark fusion (recombination). The universal value of the slope parameter is then interpreted as due to the intrinsic transverse momentum (k/sub T/) of the quarks which yields the values < k/sub T/ > / sub q/ = 0.36 + or - 0.01 GeV/c and < k/sub T/squared > /sub q/ = 0.16 + or - 0.01 (GeV/c) squared. DOE

N83-36878# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
RADIATIVE DECAY OF SURFACE PLASMONS ON NONSPHERICAL SILVER PARTICLES
J. W. Little, T. L. Ferrell, T. A. Callcott, and E. T. Arakawa 1982 12 p refs Presented at the Workshop on Phys. of Submicron Struct., Urbana, Ill., 28 Jun. 1982
(Contract W-7405-eng-26)
(DE83-014007; CONF-8206205-1) Avail: NTIS HC A02/MF A01

The radiation emitted by electron bombarded silver particles was studied. Electron micrographs have shown that the particles, obtained by heating thin (5 nm) silver films, were oblate (flattened) with minor axes aligned along the substrate normal. The characteristic wavelength obtained by bombarding these particles with 15 keV electrons was found to vary with angle of photon emission. This wavelength shift was modeled as a result of the mixture of radiation from dipole and quadrupole surface plasmon oscillations on oblate spheroids. Experimental observations of the energy, polarization, and angular distribution of the emitted radiation are in good agreement with theoretical calculations. DOE

N83-36879# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
HYDRODYNAMICS AND RELATIVISTIC HEAVY-ION COLLISIONS
Daniel Strottman 1 Apr. 1983 29 p refs Presented at the Nordic Winter School, Hemsedal, Norway, Apr. 1983 Submitted for publication
(Contract W-7405-eng-36)
(DE83-013865; LA-UR-83-1839; CONF-8304104-1) Avail: NTIS HC A03/MF A01

The hydrodynamic model as applied to heavy ion collisions is introduced. The Euler equations are derived for both relativistic and nonrelativistic domains. The effects of imposing relativistic invariance are discussed. Concepts proposed to analyze 4(LC OMEGA) exclusive reactions are introduced. Selected theoretical results are presented for reactions in which the projectile has a laboratory energy of 400 MeV per nucleon to 100 GeV per nucleon. DOE

N83-36880# California Univ., Livermore. Lawrence Livermore Lab.
EVIDENCE FOR A SECONDARY DOORWAY STATE IN A = 13 NUCLEI FROM UNPOLARIZED AND POLARIZED CAPTURE MEASUREMENTS
J. G. Woodworth, R. A. August (Triangular Univ. Nuclear Lab.), N. R. Roberson (Triangular Univ. Nuclear Lab.), D. R. Tilley (Triangular Univ. Nuclear Lab.), H. R. Weller (Triangular Univ. Nuclear Lab.), and J. W. Jury (Trent Univ., Peterborough, Ontario) May 1983 8 p refs Presented at the Light Ion Reaction Conf., Osaka, Japan, 16-20 May 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE83-014842; UCRL-89336; CONF-830598-2) Avail: NTIS HC A02/MF A01

Cross section, angular distribution and analyzing power measurements show structure and interference effects in neutron, proton and deuteron capture into the A = 13 system at about 20 MeV excitation energy. By introducing a secondary doorway state at 20.6 MeV with a 0.5 MeV width it is possible to explain the shape of the (12)(n,(BETA)0)(13)C and (12)C(p,(BETA)0)(13)N cross sections as well as the fluctuations observed in the experimental angular distributions and analyzing powers. DOE

N83-36881# Los Alamos Scientific Lab., N. Mex.
RSX SYSTEM DEVELOPMENT UNDER VAX/VMS COMPATIBILITY MODE
Mary A. Fuka 1983 7 p refs Presented at the Digital Equipment Computer Users Soc. (DECUS) Symp., St. Louis, Mo., 23-27 May 1983
(Contract W-7405-eng-36)
(DE83-014151; LA-UR-83-1808; CONF-830577-3) Avail: NTIS HC A02/MF A01

The Control System for the Proton Storage Ring now being built at Los Alamos will use a VAX-11/750 as its main control computer with several LSI-11/23 microprocessors reading and controlling the hardware. The VMS Compatibility Mode makes it possible to use the VAX as a development system for the LSI-11/23 microprocessors running the RSX-11S (stand-alone) operating system. Digital Equipment Corporation (DEC)-supplied software is used to generate the RSX-11S operating system and DECNET-11S network software. We use the VMS editors to create source files, the Macro-11 assembler and the PDP-11 FORTRAN-77 compiler

to generate object code, and the RSX Task Builder to link the executable RSX task image. The RSX task then can be tested to some extent on the VAX before it is down-line loaded to the LST-11/23 for further testing. DOE

N83-36882# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.

RING-MAGNETRON IONIZER FOR POLARIZED NEGATIVE-ION SOURCES

J. G. Alessi, T. Sluyters, and A. Hershcovitch 1983 9 p refs Presented at the Intern. Workshop on Polarized Ion Sources, Vancouver, Canada, 22-29 May 1983

(Contract DE-AC02-76CH-00016)

(DE83-014763; BNL-33272; CONF-830591-3) Avail: NTIS HC A02/MF A01

The use of the charge exchange reaction of negative deuterium ions with polarized neutral hydrogen yielding neutral deuterium and polarized negative hydrogen ions to produce polarized H(+) ions could be very efficient. While intense H(+)/D(+) ion sources exist, one encounters space charge problems when trying to put this scheme into practice. A simple method, which uses a self-extracted D(+) beam from a ring magnetron source, is proposed. The basic idea is presented, approximate numbers are given and the expected intensity is estimated. The method not only offers improvement in intensity, but equally important, improvements in reliability and lifetime. DOE

N83-36883# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Radiology.

A PICOSECOND PULSE-CONDUCTIVITY TECHNIQUE APPLIED TO STUDY EXCESS-ELECTRON REACTIONS IN HYDROCARBON MIXTURES

G. Bakale and G. Beck (Hahn-Meitner-Inst. fuer Kernfoschung) 1983 3 p refs Presented at the 7th Intern. Congr. of Radiation Res., Amsterdam, 3-8 Jul. 1983

(Contract DE-AC02-78EV-04746)

(DE83-014654; CONF-830710-4) Avail: NTIS HC A02/MF A01

To measure electron reactions on a picosecond timescale, a picosecond pulse-conductivity technique, which makes use of the electron fine-structure pulses of our LINAC (pulse width 25 vs FWHM) to produce excess electrons was developed and now changes in sample conductance under optimum conditions with an instrumental response of 18 ps are detected. This resolution is in agreement with a theoretical estimate. This technique was successfully applied to study excess electron reactions in solvents covering a mobility range from 0.24 to 100 cm(2)V(+1)s(+1); extension to lower mobility liquids seems possible. DOE

N83-36884# Argonne National Lab., Ill.

LONGITUDINAL PHASE-SPACE MATCHING BETWEEN MICROTRONS AT 185 MeV

H. Takeda 21 Mar. 1983 4 p Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983

(Contract W-31-109-eng-38)

(DE83-014681; CONF-830311-182) Avail: NTIS HC A02/MF A01

Electrons are accelerated to 185 MeV by microtron, then, injected into another microtron to boost the net energy up to a few GeV. Between the two microtrons both longitudinal and transverse phase space matching are required. A longitudinal phase ellipse matching which utilizes triple left-right-left sector dipoles to induce a negative phase angle shear is considered. This is accomplished because a high energy particle travels a shorter distance through the dipole system than a low energy particle. DOE

N83-36885# JAYCOR, Alexandria, Va.

COLLECTIVE ION ACCELERATION BY A REFLEXING ELECTRON BEAM: MODEL AND SCALING

F. Mako and T. Tajima (Texas Univ., Austin) Jul. 1983 24 p refs

(Contract DE-FG05-80ET-53088)

(DE83-015298; DOE/ET-53088/99) Avail: NTIS HC A02/MF A01

Analytical and numerical calculations are presented for a reflexing electron beam type of collective ion accelerator. These results are then compared to those obtained through experiment. By constraining one free parameter to experimental conditions, the self-similar solution of the ion energy distribution agrees closely with the experimental distribution. Hence the reflexing beam model appears a valid model for explaining the experimental data. Simulation shows in addition to the agreement with the experimental ion distribution that synchronization between accelerated ions and electric field is phase unstable. This instability seems to further restrict the maximum ion energy to several times the electron energy. DOE

N83-36886# Argonne National Lab., Ill.

HIGH-PRECISION, SYSTEMATIC STUDY OF HYPERFINE STRUCTURE IN THE 4F/SUP N/6S(2) CONFIGURATION OF THE NEUTRAL RARE EARTHS

W. J. Childs, L. S. Goodman, and V. Pfeufer 1983 4 p Presented at the DOE Contractors' Workshop, Oak Ridge, Tenn., 21 Apr. 1983

(Contract W-31-109-eng-38)

(DE83-014202; CONF-830449-3) Avail: NTIS HC A02/MF A01

Although the hyperfine structure (hfs) of many-electron atoms were studied intensively in recent years, it is still difficult to distinguish between the competing effects of relativity and configuration interaction. The 4f/sup N/6s(2) configuration of the neutral rare earths is of particular interest because (1) the low-lying terms are relatively free of configuration interaction, and (2) trends can be examined systematically as one proceeds through the long 4f-shell. The procedure is to deduce, from the measured hfs constants of low levels, the underlying hyperfine radial integrals for comparison with ab initio predictions. Since some of these integrals are extremely sensitive to any configuration interaction and others are not, it is possible to determine both the extent and type of configuration interaction present in some cases. Prior to the start of the present research no precise hfs information existed for the entire second half of the 4f shell of the rare earths. The present measurements were designed both to provide such data and to make possible a systematic study of the hfs throughout the 4f shell. DOE

N83-36887# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.

POSSIBLE USE OF SYNCHROTRONS AS POST-ACCELERATION BOOSTERS FOR TANDEMS

P. Thieberger 1983 9 p refs Presented at the 6th Intern. Tandem Conf., Chester, England, 16 Apr. 1983

(Contract DE-AC02-76CH-00016)

(DE83-014443; BNL-33218; CONF-8304105-1) Avail: NTIS HC A02/MF A01

The recent development of a high intensity negative ion source and the demonstration that intense heavy ion beam bursts are accelerated by a large tandem make synchrotrons a possibly attractive alternative when considering different types of tandem-injected heavy-ion-booster accelerators. DOE

N83-36888# Sandia Labs., Albuquerque, N. Mex. Pulsed Power Research Div.

THE PBFA 2 CONCEPTUAL DESIGN

D. L. Johnson, E. L. Neau, and B. N. Turman 1983 12 p refs Presented at IEEE Power Electron. Specialists Conf., Albuquerque, N. Mex., 6 Jun. 1983

(Contract DE-AC04-76DP-00789)

(DE83-013633; SAND-82-2732C; CONF-830621-20) Avail: NTIS HC A02/MF A01

The Particle Beam Fusion Accelerator (PBFA)-II accelerator conceptual design is outlined. Initial Marx generator studies indicate a sound design of the energy storage section of the accelerator. Computer modeling of the pulse forming network indicates double-bounce charging can produce the desired machine output at safe field stress levels. The effects of obtainable jitters in the various accelerator components have been studied and appear to

have an acceptable degradation on machine output. Research and development is under way on a low jitter, laser triggered switch. DOE

N83-36889# Sandia Labs., Albuquerque, N. Mex. Pulsed Power Engineering Div.
PBFA II ENERGY-STORAGE-SECTION DESIGN
J. Michael Wilson 1983 4 p ref Presented at the IEEE Power Electronics Specialists Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013969; SAND-83-0303C; CONF-830621-37) Avail: NTIS HC A02/MF A01

PBFA II will be the second thirty-six module accelerator built at Sandia National Laboratories for particle beam fusion feasibility studies. Each module of the machine will deliver 2.8 terawatts to a central experimental chamber. The total power delivered (100 terawatts) is expected to permit ignition scaling studies beginning in 1986. The FBFA II energy storage system consists of thirty-six 6.0-MV, 400-kJ, Marx generators with their high voltage trigger and charging systems, and electro-mechanical output switching system. The current design of this section of the machine is described. Constraints imposed by the existing tank and building are presented, as they relate to locating support systems in the oil section of PBFA II. The charging system and output switches were designed and are described. A conceptual design for the Marx triggering system is also presented. Additional hardware (monitors, grounding connections, etc.) is discussed briefly with design given where available. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N83-36890# Rockwell International Corp., Richland, Wash. Energy Systems Group.
LONG-TERM HIGH-LEVEL DEFENSE-WASTE TECHNOLOGY Progress Report, Apr. - Jun. 1982
Jul. 1982 19 p
(Contract DE-AC06-77RL-01030)
(DE83-000375; RHO-WM-SR-82-1-3QP) Avail: NTIS HC A02/MF A01

In the residual liquid solidification effort, the primary alternative studied is the wiped film evaporator approach to solidifying salt well pumped liquids and returning the molten material to single shell tanks for microwave final stabilization to a hard dry product. Both systems analysis and experimental work are proceeding to evaluate this approach. The primary alternative for in situ stabilization of in-tank wastes is microwave drying of wet salt cake and unpumped sludges. Experimental work was successfully conducted on a 1/12 scale tank containing wet synthetic salt cake. Related systems analysis of a full scale system was initiated. DOE

N83-36891# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
IRRADIATION EFFECTS IN THE STORAGE AND DISPOSAL OF RADIOACTIVE ION-EXCHANGE RESINS
Karl J. Swyler, Cleveland E. Dodge, Ramesh Dayal, and Allen J. Weiss 1982 9 p refs Presented at the 6th Intern. Symp. on the Sci. Basis for Radioactive Waste Management, Boston, 1 Nov. 1982
(Contract DE-AC02-76CH-00016)
(DE83-0001311; BNL-NUREG-31894; CONF-821107-12) Avail: NTIS HC A02/MF A01

The effects of self irradiation on radwastes which may be generated when organic ion exchange media are used in water demineralization or decontamination operations at nuclear facilities are studied. External factors affecting the relation between laboratory evaluations and field performance are emphasized. Initial experiments do not yet indicate substantial radiation dose rate effects on radiolytic gas yields or acid product formation, when (fully swollen) sulfonic acid resins are irradiated in a sealed air environment. At the same time, oxygen gas is removed from the environment of irradiated resins. Interaction between mild steel coupons and acidic species produced in the irradiation induced decomposition of sulfonic acid resin results in irradiation enhanced corrosion. Corrosion rates depend on radiation dose rate, moisture content and resin chemical loading. DOE

N83-36892# Los Alamos Scientific Lab., N. Mex.
FLIGHT-SYSTEM SAFETY PROGRAM Progress Report, Sep. 1982
S. E. Bronisz, ed. Feb. 1983 18 p refs
(Contract W-7405-eng-36)
(DE83-008356; LA-9673-PR) Avail: NTIS HC A02/MF A01

This technical monthly report covers studies related to the use of (238)PuO2 in radioisotope power systems carried out for the Office of Space Nuclear Projects of the US Department of Energy by Los Alamos National Laboratory. Most of the studies discussed here are ongoing. Results and conclusions described may change as the work continues. DOE

N83-36893# Rockwell International Corp., Calif. Energy Systems Group.
HELIUM GENERATION IN FUSION REACTOR MATERIALS Progress Report, Jan. - Mar. 1982
D. W. Kneff and H. Farrar 1982 17 p refs
(Contract DE-AT03-76ET-52015)
(DE82-015579; DOE/ET-52015/T19) Avail: NTIS HC A02/MF A01

Helium accumulation neutron dosimetry for the Omega West Reactor was studied. Neutron energy spectrum unfolding using combined helium accumulation and radiometric measurements was demonstrated for the neutron environment of the Omega West Reactor. The RTNS-II fluence mapping and helium generation cross sections were investigated. Neutron fluence contours were calculated for the high flux region of the RTNS-II sample irradiation volume, and the cross section of elemental lead was determined for 14.8 MeV neutrons. Combined helium accumulation and radiometric dosimetry for Be(d,n) neutron spectra was also studied. Neutron energy spectrum unfolding using combined helium accumulation and radiometric measurements was demonstrated for the Be(d,n) neutron environment. DOE

N83-36894# California Univ., Livermore. Lawrence Livermore Lab.
NUCLEAR ENERGY IN SPACE
Horst Loeb (Giessen Univ., Germany) Apr. 1983 28 p refs Transl. into ENGLISH from Atomkernenergie/Kerntech. (West Germany), v. 40, no. 1, 1982 p 23-30
(Contract W-7405-eng-48)
(DE83-011128; UCRL-Trans-11841) Avail: NTIS HC A03/MF A01

The electric onboard power requirements of spacecraft have steadily increased since the launching of the first spacecraft, and power requirements of Earth satellites as high as 10 kW are currently observed. Since the early 1960s, nuclear power installations in space have been used by the U.S. and the Soviet Union in connection with electric power requirements which cannot be satisfied by solar cells. Such requirements are related to flights to the outer planets and the operation of spacecraft in the lunar or planetary shadow (including the shadow of the Earth). Possibilities for the use of nuclear energy in space are discussed, and the employment of radioisotope batteries is considered. G.R.

N83-36895# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
DIRECTIONS IN LOW-LEVEL RADIOACTIVE-WASTE MANAGEMENT. NATIONAL LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PROGRAM
Oct. 1982 67 p refs
(Contract DE-AC07-76ID-01570)

(DE83-003145; DOE/LLW-6T) Avail: NTIS HC A04/MF A01

The majority of states face a growing problem in the management of low-level radioactive waste generated within their borders. The current uncertainty regarding the availability of disposal sites for these waste products exacerbates their increasing generation rate. State governments are assisted in planning effective policy to address these problems. Background information is presented on the situation, the responsibilities of state government, and the assistance available to states from federal agencies and national groups. State policy planning, including: (1) methodology for assessing a state's waste management status and for projecting future needs, (2) consideration of waste management options for a state, and (3) insight into the possible effects and implications of planned policies is emphasized. This information is intended primarily for state officials--executive, legislative, and agency--and does not include detailed technical information on waste characteristics or handling techniques. DOE

N83-36896*# National Academy of Sciences - National Research Council, Washington, D. C.

PROCEEDINGS OF A SYMPOSIUM ON ADVANCED COMPACT REACTOR SYSTEMS Final Report

Apr. 1983 565 p refs Symp. held in Washington, D.C., 15-17 Nov. 1982 Sponsored in cooperation With NASA, Dept. of the Army, Dept. of the AF, and DARPA

(Contract N00014-82-C-0373)

(NASA-CR-173089; NAS 1.26:173089; PB83-218172) Avail: NTIS HC A24/MF A01 CSCL 18I

Reactor system technologies suitable for a variety of aerospace and terrestrial applications are considered. Technologies, safety and regulatory considerations, potential applications, and research and development opportunities are covered. GRA

N83-36897# National Bureau of Standards, Washington, D.C. Reactor Radiation Div.

NBS REACTOR: SUMMARY OF ACTIVITIES Technical Note, Jul. 1981 - Jun. 1982

Frederick J. Shorten, ed. Jun. 1983 235 p refs

(PB83-218636; NBS-TN-1178) Avail: NTIS HC A11/MF A01 CSCL 20L

Programs which depend on the NBS reactor were summarized from July 1981 through June 1982. The programs range from the use of neutron beams to study the structure and dynamics of materials through nuclear physics and neutron standards to sample irradiations for activation analysis, isotope production, radiation effects studies, neutron radiography, and nondestructive evaluation. GRA

74 OPTICS

Includes light phenomena.

N83-36898* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HIGH SPEED MULTI FOCAL PLANE OPTICAL SYSTEM Patent

Peter O. Minott, inventor (to NASA) 4 Oct. 1983 6 p Filed 22 Dec. 1981 Supersedes N82-24973 (20 - 15, p 2159)

(NASA-Case-GSC-12683-1; US-Patent-4,407,563; US-Patent-Appl-SN-333535; US-Patent-Class-350-173; US-Patent-Class-350-445) Avail: US Patent and Trademark Office CSCL 20F

An apparatus for eliminating beamsplitter generated optical aberrations in a pupil concentric optical system providing a plurality of spatially separated images on different focal planes or surfaces is presented. The system employs a buried surface beamsplitter having spherically curved entrance and exit faces which are concentric to a system aperture stop with the entrance face being located in the path of a converging light beam directed there from an image forming objective element which is also concentric to the aperture stop.

Official Gazette of the U.S. Patent and Trademark Office

N83-36899# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.

INFRARED ABSORPTION SPECTRA OF SYNTHETIC DIAMOND AND CBN MICROPOWDERS

V. G. Malogolovec and I. A. Petrusa 1982 14 p refs Transl. into ENGLISH from Sverhtverdye Materialy (USSR), no. 6, 1980 p 11-14

(CSIR-Trans-1651) Avail: NTIS HC A02/MF A01

Industrial and laboratory-produced synthetic diamond and cubic boron nitride (CBN) micropowders were investigated by absorption spectroscopy. Infrared spectrograms of the samples were prepared by the KBr tablet method using a two-beam UR-20 spectrometer in the 4040 - 400/cm rangen The weight of the KBr salt suspension was 300 mg and KBr tablets measured 0.5 x 2,7 x 0.067 cm.

N.W.

N83-36900# California Univ., La Jolla. Dept. of Electrical Engineering and Computer Sciences.

FRESNEL (CHIRPED GRATING) LENSES AND BEAM CONTROL IN OPTICAL WAVEGUIDES Annual Report, 1 Oct. 1981 - 30 Sep. 1982

William S. C. Chang, S. Forouhar, J. M. Delavaux, and Christopher Warren 15 Feb. 1983 37 p refs

(Grant AF-AFOSR-0037-80; AF Proj. 2305)

(AD-A126374; AFOSR-83-0141TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

A great deal of progress was made in the experimental investigation of chirped grating lenses on glass and LiNbO3 waveguides. Efficiency as high as 0% has been demonstrated in LiNbO3 using deposited TiO2 on Ti-indiffused waveguides and doubly ion exchanged LiNbO3 in benzoic acid. Properties of chirped grating lenses affected by the waveguide parameters, higher orders of diffraction and substrate mode conversion were evaluated.

Author

N83-36901# Tracor, Inc., Rockville, Md.

FIBER OPTIC ELECTRIC FIELD SENSOR INVESTIGATIONS, PART 2 Final Report

Marc D. Mermelstein 2 May 1983 24 p refs

(Contract N00014-81-C-0515)

(AD-A129138; TRACOR-T-83-RV-5260) Avail: NTIS HC A02/MF A01 CSCL 17/8

In June 1981 the Office of Naval Research contracted with Tracor, Inc. to experimentally investigate the potential of interfacing piezoelectric polymers and single mode fibers for the development of an optical fiber electric field sensor. The continuation and conclusion of that effort is reported herein. Experiments were performed whereby a single mode fiber was embedded in a piezoelectrically active vinylidene fluoride-tetrafluoroethylene copolymer film. Application of an external electric field to the fiber copolymer composite induces strains in the polymer film that are transferred to the core of the optical fiber. The resultant phase shift in the propagating light is detected with a Mach-Zehnder interferometer and correlated to the amplitude of the applied electric field. GRA

N83-36902# Stanford Univ., Calif. Labs. for Electronics.

OPTICAL COMPUTING RESEARCH Annual Report, 1 Jan. 1982 - 31 Jan. 1983

Joseph Goodman, Lambertus Hesselink, Qizhi Cao, Raymond Kostuk, Ellen Ochoa, and Rae-Hong Park 31 Mar. 1983 57 p refs

(Grant AF-AFOSR-0089-82; AF Proj. 2305)

(AD-A129166; AFOSR-83-0494TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

The work covers several different areas of optical computing, as well as some work on digital processing of optically obtained images. The primary emphasis of the work is on the possible applications of optics to interconnections in integrated circuit technology. Other areas of effort include the diagonalization and

inversion of circulant matrices using coherent optics, the division of complex wavefronts using four-wave mixing, and the suppression of speckle in coherently formed images. Publications during the last year arising out of work supported by the grant are also detailed. GRA

N83-36903# City Univ. of New York, N. Y. Dept. of Physics.
HIGH SENSITIVITY OPTICAL, MODULATED OPTICAL AND RAMAN INVESTIGATION OF GaAs AND ITS OXIDES Final Report
F. H. Pollak 1983 6 p refs
(Contract N00014-78-C-0718)
(AD-A128703) Avail: NTIS HC A02/MF A01 CSCL 20/6

The original purpose of this research program was to investigate the anodic oxidation process in GaAs utilizing sensitive optical techniques. The nature of surfaces in the preparation of semiconductor devices has been a concern of long standing. In particular, the increasingly important role played by GaAs in the fabrication of semiconductor devices suggested the need for a more fundamental understanding of its surfaces. Recently, considerable interest has been shown towards oxidation from the viewpoint of application of surface passivation, planar technology and fabrication of MOS field effect transistors. One initial study of the anodic oxidation process in GaAs led to a broader investigation of the properties of the semiconductor-electrolyte interface. In particular, we found new applications of electrolyte electroreflectance (ERR) to gain information about this important interface. This work has led to the development of EER as a technique to study surfac potential distribution (including flat-band and Fermi-level pinning), optical determination of electrical properties, etc. Author (GRA)

N83-36904# Rochester Univ., N. Y. Inst. of Optics.
IMAGE CORRELATION USING NONCOHERENT ILLUMINATION Final Report, 8 Sep. 1980 - 7 Sep. 1983
Nicholas George May 1983 55 p refs
(Contract DAAG29-80-K-0063)
(AD-A129744; ARO-17565.2-PH) Avail: NTIS HC A04/MF A01 CSCL 20/6

Theoretical and experimental studies of two distinct electro-optic systems for automatic pattern recognition are reported. One uses a novel wide-band frequency plane filter, i.e., an achromatized holographic matched filter system. The second uses a virtual twin-image interferometer together with a Fourier achromat and a photodetector to form a hybrid electro optic processor that is potentially capable of high rate automatic sorting for incoherent imagery of very large space-bandwidth product. Both have been studied using noncoherent spectrally broadband illumination. Also excellent progress is reported on our related studies of broadband holographic optical elements and an off-axis Fourier transform achromat. With coherent illumination the author reports a means for automatic image quality evaluation. The scattering of light by dielectric and conducting cylinders has been studied theoretically and experimentally with an emphasis on remote optical metrology. Author (GRA)

N83-36905# Battelle Columbus Labs., Ohio.
OPTICAL WAVEGUIDE SPATIAL FILTERS Annual Technical Report
R. P. Kenan and C. M. Verber 20 May 1983 38 p refs
(Contract F49620-79-C-0044; AF Proj. 2305)
(AD-A129746; AFOSR-83-0530TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

Progress in the development of an Integrated Optical Circuit (IOC) to perform (analog) matrix-vector multiplication (16 squared x 16) is presented. The IOC utilizes the engagement architecture. Author (GRA)

N83-36906# University of Southern California, Los Angeles. Image Processing Inst.
NONLINEAR REAL-TIME OPTICAL SIGNAL PROCESSING Annual Technical Report, 15 Apr. 1981 - 14 Apr. 1982
A. A. Sawchuk, T. C. Strand, and A. R. Tanguay, Jr. 30 Jun. 1982 70 p refs
(Grant AF-AFOSR-0082-81; AF Proj. 2301)
(AD-A129291; USCIPI-1080; AFOSR-83-0081TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

The results of a one year research program in nonlinear real-time optical signal processing are described. The goal of the program is to extend fast parallel nonlinear operations to optical processing systems with large time-bandwidth and space-bandwidth products. The research has concentrated on optical mode (vgm) liquid crystal real-time spatial light modulators. Parallel and twisted nemtic liquid crystal light value (lclv) devices have been used as a nonlinear element in a feedback arrangement in the sequential logic systems. A computer generated hologram fabricated on an e-beam system serves as a beam steering interconnection element. A completely optical oscillator and frequency divider have been exprimentally demonstrated. Research has continued on variable-grating mode (VGM) liquid crystal devices that perform local spatial frequency modulation as a function of the incident intensity. These devices can be used for nonlinear processing by selection and recombination of these spatial frequency components. These devices have many interesting physical effects with useful applications in both analog and numerical optical signal processing. Preliminary theoretical modeling work to expalin these effects is given, and an improved implementation of the intensity level slice function with VGM devices has been demonstrated. GRA

N83-36907# Rome Air Development Center, Griffiss AFB, N.Y. Electromagnetic Sciences Div.
THE NEED FOR AN EXPANDED DEFINITION OF GLISTENING SURFACE
Robert J. Papa, John F. Lennon, and Richard L. Taylor Oct. 1982 44 p refs
(AF Proj. 2305)
(AD-A130431; RADC-TR-82-271) Avail: NTIS HC A03/MF A01 CSCL 20/14

The first topic of this report is an analysis of the conditions under which the conventional definition of length of the glistening surface, as given by Beckmann and Spizzichino, is not valid. For a wide range of conditions, significant amounts of incoherent scattered power can be received from areas beyond the conventional length. A second topic is the investigation of the effect on angular tracking accuracy due to such scattering factors as shadowing, surface height distribution, standard deviation in surface height sigma, surface correlation length T, unevenness and inhomogeneity of the terrain, antenna heights, signal frequency and signal polarization. A number of interesting results have been observed. The amount of additional incoherent power not included under the conventional definition depends on the ratio sigma/T, except for the case where both transmitter and receiver are very close to the surface. Next, a Gaussian surface height distribution generally results in less diffuse scattering than an exponential one. The trends seen in the results for scattering from the glistening surface do not differ for horizontal or vertical polarization, for Gaussian or exponential surface height distribution, or for different signal frequencies in the S-band to L-band regions. In an absolute sense, the results for vertical polarization indicate that there would be greater angular tracking accuracy for that case than for horizontal polarization, a result of particular interest for radar applications. Author (GRA)

N83-36908# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
ADAPTIVE HYBRID PICTURE CODING Final Report, 30 Sep. 1977 - 1 Oct. 1982
Richard A. Jones, Carl D. Bowling, and Yogendra Tejwani 5 Feb. 1983 122 p refs
(Grant AF-AFOSR-3456-77; AF Proj. 2304)
(AD-A129221; AFOSR-83-0499TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report consists of two parts. In part one, a time modified autoregressive model for interframe image coding is presented. This method is compared with previous work in the field of interframe image coding and it is shown that substantial simplifica-

tions occur when the nearest integer displacement is taken into account. It is demonstrated that when the between frame noise is minimal and the motion is pure translation or can be modelled by translation, enough information can be extracted from the predictor coefficients to determine the non-integer displacement with small error. In part two, a new concept for examining shapes as vectors in a shape space is described. The shape space is defined in terms of its properties and the importance of the independence of the size variable to the shape vectors, defined on this shape space, is stressed. Also, two theorems helpful in the process of comparing partial shapes to the complete shape are stated and proved. A new method for detecting the points on a shape which appear to dominate visual perception is described. This method, called the Adaptive Line of Sight method detects the dominant points on a shape even though they do not always occur on points of high curvature. With this method, the critical points, or dominant points, of the shape that are determined are based on a set of coordinate axes that are dependent on the shape itself. Therefore, the points determined are independent of size, rotation, or relative displacement. GRA

N83-36909# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
WHITE-LIGHT OPTICAL INFORMATION PROCESSING AND HOLOGRAPHY Annual Report, 15 Feb. 1982 - 14 Feb. 1983
Francis T. S. Yu 3 May 1983 53 p refs
(Grant AF-AFOSR-0148-81; AF Proj. 2305)
(AD-A129682; AFOSR-83-0502TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

The coherence requirement, source encoding, and signal sampling concept for the proposed white-light optical signal processor were evaluated. The spatial coherence requirement is shown to be governed by source distributions, while the temporal coherence requirement is controlled by spatial frequency bandwidth of the input signal and the grating sampling frequency. In order to alleviate the basic constraints of a white-light source, a source encoding and signal sampling concept was developed so that the information can be processed in complex amplitude for the entire spectral band of the white-light source. An apparent transfer function for the proposed white-light signal processors was evaluated. The MTF is shown to be dependent upon the degree of spatial and temporal coherence. The derived apparent transfer function is very general, which can be applied to any partially coherent optical processor. Author

N83-36910# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.
COMPUTER ANALYSIS OF TIME-VARYING IMAGERY Final Report, 1 Feb. 1982 - 31 Jan. 1983
Wesley E. Snyder and Sarah A. Rajala Jan. 1983 110 p refs
(Contract DAAG29-82-K-0070)
(AD-A129672; ARO-18249.2-EL) Avail: NTIS HC A06/MF A01 CSCL 17/8

This report documents the study of computer analysis of time varying imagery. The research is on the development of techniques which locate, track, identify and characterize a single rigid target moving in an image sequence in which the camera platform is also moving. A summary of the primary products of this research are listed in the following: (1) a moving target detection algorithm, (2) a window tracking and predicting algorithm, (3) a corner matching algorithm, (4) a near natural language mechanism for describing motion, (5) a procedure for extracting target images, (6) a background motion estimation algorithm, and (7) a database of time-varying stereo imagery. GRA

N83-36911# Hughes Research Labs., Malibu, Calif.
MULTIWAVELENGTH BIDIRECTIONAL COUPLER-DECOUPLERS Interim Report, 1 May - 31 Oct. 1982
H. W. Yen and J. Myer Ft. Monmouth, N.J. CECOM Mar. 1983 39 p refs
(Contract DAAB07-82-C-J071; DA Proj. 1L1-62701-AH-92)
(AD-A129639; CECOM-82-C-J071-1; IR-1) Avail: NTIS HC A03/MF A01 CSCL 20/6

This is an exploratory program to develop, fabricate and test a family of active and passive, single and two-fiber, fiber optic multiwavelength, bidirectional, coupler-decoupler modules. The goal of the contract is to have each member of the coupler-decoupler (multiplexer-demultiplexer) family be capable of coupling energy into, and decoupling energy out of, a single optical transmission line, using a minimum of four wavelengths for the simultaneous full duplex transmission of a minimum of four optical channels. The coupler-decoupler will be designed for low throughput loss (< 5 dB per channel, per single pass) and minimum crosstalk (no more than -35 dB of the received optical signal. The modules fabricated during the program will be evaluated for their ability to meet military environmental requirements, particularly with respect to temperature. The approach uses the miniature planar Rowland spectrometer configuration recently developed at Hughes Research Laboratories (HRL) for NASA, as the basic building block for constructing the coupler-decoupler required for this program, eliminating the need for collimating optics, prisms, or thin film filters. Author (GRA)

N83-36912# Naval Ocean Systems Center, San Diego, Calif.
THE SUBFLR: AN ALGORITHM FOR CALCULATING SURFACE-BASED FLIR DETECTION RANGES Technical Document Report, Jan. - Sep. 1982
G. Hughes, M. R. Paulson, and F. P. Snyder 25 Jan. 1983 23 p refs
(AD-A129700; NOSC/TD-568) Avail: NTIS HC A02/MF A01 CSCL 12/1

A model is described for assessing the effects of scattering and absorption of infrared radiation by atmospheric aerosols and gases on the ranges at which surface targets can be detected against their natural backgrounds by a surface-based FLIR system. The equations from the model are implemented via a computer program which calculates detection range. GRA

N83-36913# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
TESTING OF A PROTOTYPE FRESNEL-LENS CONCENTRATOR FOR THERMAL APPLICATIONS
Allan Lewandowski Feb. 1983 8 p refs Presented at the 6th Ann. ASME Tech. Conf. on Com. Building Heating and Cooling Appl., Orlando, Fla., 19 Apr. 1983
(Contract DE-AC02-77CH-00178)
(DE83-007312; SERI/TP-253-1893; CONF-830405-17) Avail: NTIS HC A02/MF A01

The data obtained from testing a fresnel-lens concentrator were presented and utilized by a subcommittee of the American Society for Testing and Materials (ASTM) in the development process for the standard. Several tests were conducted on the concentrator using draft versions of the standard as guidance. Additional tests allowed but not required by the standard were conducted to determine the effect of the direct solar irradiance level on collector performance. It is the results of these additional tests that are of primary interest. The data show that non-linear heat losses cause collector efficiency to be a function of both (RADICAL) t/I/sub DN/ and I/sub DN/ and that the efficiency when fluid temperature is near ambient is also a function of I/sub DN/. This latter result is a characteristic unique to this collector, whereas the former holds for any collector with non-linear with heat loss. DOE

N83-36914# Sandia Labs., Albuquerque, N. Mex.
AN EXPERIMENTAL STUDY OF NEAR-INFRARED REFLECTANCE OF PVC
T. Y. Chu 1983 31 p refs Presented at the 21st ASME/AIChE Natl. Heat Transfer Conf., Seattle, 24 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-006811; CONF-830702-6) Avail: NTIS HC A03/MF A01

Reflectance measurements were made of twelve colored PVC samples at 1.5, 2, 3, 4, and 10 (SIGMA)m. The effect of color was found to be carried into the near infrared. For near normal incidence, the sample showed a specular peak on an essentially

diffuse base. An integral heat transfer experiment confirmed the measurements. DOE

N83-36915# California Univ., Livermore. Lawrence Livermore Lab.
OPTICAL SHUTTERS USING MICROCHANNEL PLATE (MCP) INTENSIFIER TUBES
David E. Kotecki and Richard Lear Jun. 1983 19 p refs Presented at the 27th Ann. Intern. Tech. Symp. on High Speed Phot., Videography and Photonics, San Diego, Calif. 21-26 Aug. 1983
(Contract W-7405-eng-48)
(DE83-014943; UCRL-88917; CONF-830874-7) Avail: NTIS HC A02/MF A01

Optical shutters with exposure times approaching 1 ns were achieved by gating either the photocathode or the microchannel plate of 18-mm proximity-focused microchannel plate intensifier tubes. Measurements of the shuttle performance, including the total optical gate, uniformity vs time, resolution, linearity, and dynamic range, for a number of intensifier tubes under various types of pulsing configurations were presented. Properties of intensifier tubes related to fast gating and limitations on the gating speed imposed by the intensifier tube geometry are discussed. Results with a specially modified intensifer in which all but a 3 mm x 18-mm portion of the photocathode was masked off by an opaque metallic undercoating, along with preliminary results of gating third-generation (GaAs photocathode) intensifier tubes were given. A characterization procedure used to evaluate the performance of each optical shutter is discussed, along with a review of fast electrical pulsers suitable for gating intensifier tubes. DOE

N83-36916# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
TWO INSTRUMENTS FOR FAR-INFRARED ASTROPHYSICS
James Lawrence Bonomo May 1983 133 p refs
(Contract DE-AC03-76SF-00098)
(DE83-015985; LBL-14738) Avail: NTIS HC A07/MF A01

Two instruments for far infrared astrophysics are described. The first is a broad-band photometer used on White Mountain for astronomical observations from 10 to 30 cm(+1) (300 GHz to 1 THz; lambda, 1 mm to 330 (SIGMA)). The optical system of the telescope includes a light weight, high speed, chopping secondary. The L (4)He-cooled photometer uses low pass filters and a L(3)He-cooled, composite bolometer. The system performance is evaluated, and the site is compared to other possible platforms. The second project is a balloon-borne spectroradiometer to measure the cosmic background radiation from 3 to 10 cm(+1) (100 GHz to 300 GHz; lambda, 3 mm to 1 mm). The apparatus has five bandpass filters with excellent rejection at higher frequencies, a low noise chopper, and an internal calibrator. The design and use of calibrators for such an experiment and develop a model of calibration procedures is described. The calibrations of several reported measurements are analyzed with this model, and flaws are found in one procedure. Finally, the system performance is used to estimate the accuracy this experiment can achieve. DOE

N83-36917# Los Alamos Scientific Lab., N. Mex.
ANTARES BEAM-ALIGNMENT-SYSTEM PERFORMANCE
Q. D. Appert and S. C. Bender 1983 8 p refs Presented at the Los Alamos Conf. on Optics '83, Santa Fe, N. Mex., 11-15 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014180; LA-UR-83-1668; CONF-830425-25) Avail: NTIS HC A02/MF A01

The beam alignment system for the 24-beam-sector Antares CO2 fusion laser automatically aligns more than 200 optical elements. A visible-wavelength alignment technique is employed which uses a telescope/TV system to view point-light sources appropriately located down the beamline. The centroids of the light spots are determined by a video tracker, which generates error signals used by the computer control system to move appropriate mirrors in a closed-loop system. Final touch-up alignment is accomplished by projecting a CO2 alignment laser beam through the system and sensing its position at the target location. The techniques and control algorithms employed have resulted in alignment accuracies exceeding design requirements. By employing video processing to determine the centroids of diffraction images and by averaging over multiple TV frames, we achieve alignment accuracies better than 0.1 times system diffraction limits in the presence of air turbulence. DOE

N83-36918# Los Alamos Scientific Lab., N. Mex.
FUNCTIONAL ALIGNMENTS AND SELF-TESTS FOR TILTED AND DECENTERED OPTICS
W. Bauke and E. W. Cross 1983 9 p refs Presented at Soc. of Photo-Opt. Instr. Engr. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014181; LA-UR-83-1669; CONF-830425-21) Avail: NTIS HC A02/MF A01

The alignment of tilted and decentered optics is ordinarily difficult, because such optics have neither simple alignment points amenable to ordinary boresight methods, nor a simple alignment theory. Several different alignment examples which provide insight into a practical universal approach to all such systems are explored. The examples detailed are segments of the Antares Laser Fusion Project's optical train. DOE

N83-36919# Los Alamos Scientific Lab., N. Mex.
OPTICAL-DESIGN OPTIMIZATION WITH A PERSONAL COMPUTER
1983 6 p refs Presented at Photo-Opt. Instr. Engr. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014182; LA-UR-83-1670; CONF-830425-22) Avail: NTIS HC A02/MF A01

Advances in optical design were closely related to advances in numerical computation. The microcomputer revolution now taking place promises to open the way for new and innovative optical design. This will take place as optical design becomes easier, more available, and far less costly, as the result of powerful canned design programs outfitted on low-cost personal computers. A user-friendly program is described which makes possible low cost automatic lens design. Solutions to some typical optical design problems are presented. Prospects for future capabilities are described. DOE

N83-36920# Los Alamos Scientific Lab., N. Mex.
APPLICATION OF THIN-FILM ABSORBER COATINGS TO ENHANCE THE SENSITIVITY OF FAST PYROELECTRIC DETECTORS
Peter C. LaDelfe, S. C. Stotlar, and L. B. Edgett 1983 9 p refs Presented at the Soc. of Photo-Opt. Instr. Engr. Conf., Santa Fe, N. Mex., 11-15 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014148; LA-UR-83-1900; CONF-830425-31) Avail: NTIS HC A02/MF A01

Multilayer optical absorber coatings may be applied to the faces of thermal detectors to enhance their sensitivity at wavelengths at which the detector material exhibits low absorptivity. These coatings have extremely low mass (< 100 (SIGMA)g/cm(2)) and the absorptance may be varied from 0 to near 100%. The design of these coatings is discussed, based on considerations derived from the detector application and experimental data is presented showing the effect on sensitivity. DOE

N83-36921# National Bureau of Standards, Washington, D.C. Radiometrics Physics Div.
STANDARD REFERENCE MATERIALS: WHITE OPAL GLASS DIFFUSE SPECTRAL REFLECTANCE STANDARDS FOR THE VISIBLE SPECTRUM (SRM'S 2015 AND 2016) Final Report
Victor R. Weidner Apr. 1983 36 p refs
(PB83-220723; NBS-SP-260-82; LC-83-600516) Avail: NTIS HC A03/MF A01 CSCL 20F

Vitrolite white opal glass was calibrated for use as diffuse spectral reflectance standards since 1944. Its uniformity and long-term durability make it useful as an everyday working standard

for spectrophotometric measurements in the visible spectral range. However, its translucency can introduce some errors in such measurements if improperly used. Prior to 1965 the Vitrolite reflectance standards were issued with diffuse reflectance values relative to freshly smoked magnesium oxide. Since that date the calibration of these standards is reported on an absolute reflectance scale or one which is relative to a perfect diffuser. The Vitrolite reflectance standards are now more accurately characterized and are being issued as a Standard Reference Material. GRA

N83-36275# Hokkaido Univ., Sapporo (Japan).
REFRACTIVE INDEX PROFILE AND ITS GUIDED MODE CHARACTERISTICS OF ION-EXCHANGED PLANAR OPTICAL WAVEGUIDES
Norihisa Haneda, Masaaki Imai, and Yoshihiro Ohtsuka *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 89-100 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N83-36922# Commissariat a l'Energie Atomique, Saclay (France). Service de Documentation.
THE STUDY AND USE OF ION BEAMS PRODUCED IN THE FOCUS EXPERIMENT [ETUDE ET UTILISATION DES FAISCEAUX D'IONS ENGENDRES DANS L'EXPERIENCE FOCUS]
A. Bernard, J. P. Garconnet, A. Jolas, J. P. LeBreton, and J. deMascureau Jun. 1982 47 p refs In FRENCH
(CEA-R-5171) Avail: NTIS HC A03/MF A01

Research conducted with CD2 or Li DLi targets in the 200 kJ Actime installation resulted in determination of the characteristics of the ion beams bombarding the target. The temperatures reached by deuteron bombarded Ta metal targets were measured and a numerical code was used to calculate em energy deposition. Planned improvements and the perspectives offered by this type of experiment are indicated. Transl. by A.R.H.

N83-36923# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MULTIPOLE STABILIZATION OF ROTATIONAL INSTABILITY IN A THETA PINCH 1
Tsutomu Ishimura (Osaka Univ., Japan) Jul. 1983 47 p refs
(IPPJ-638) Avail: NTIS HC A03/MF A01

Approximation techniques for estimating spatially varying coefficients and unknown boundary parameters in second order hyperbolic systems were discussed. Methods for state approximation (cubic splines, tau-Legendre) and approximation of function space parameters (interpolatory splines) are outlined and numerical findings for use of the resulting schemes in model '1-D seismic inversion' problems are summarized. Author

N83-36924# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TRITIUM BREEDING IN DT-DD HYBRID PELLET FOR INERTIAL CONFINEMENT FUSION
Haruhiko Takase, Shigeo Kawata, and Keishiro Niu Jun. 1983 18 p refs
(IPPJ-637) Avail: NTIS HC A02/MF A01

The phenomenology of thermonuclear burn with a secondary reaction is investigated by using a method of numerical simulation for a DT-DD hybrid pellet with a high density. The simulation is carried out by use of a one dimensional hydrodynamic Lagrangian code, showing the capability of tritium breeding in the hybrid pellet. The breeding ratio in the pellet is clarified to be able to exceed unity when the following two conditions are satisfied. (1) The amount of tritium is remarkably less than the amount of deuterium initially stored in the pellet, so that the amount of tritium produced by DD reactions is beyond the initial amount of tritium. (2) The pellet has a so high temperature and a so high rho R, that the amount of tritium does not decrease anomalously through the secondary DT reaction, because the rate of DT reactions decreases as the temperature increases above 70 keV. Author

N83-36925# Nagoya Univ. (Japan). Inst. of Plasma Physics.
RECOMMENDED DATA ON EXCITATION OF CARBON AND OXYGEN IONS BY ELECTRON COLLISIONS
Y. Itikawa, S. Hara, T. Kato, S. Nakazaki, M. S. Pindzola, and D. H. Crandall Jun. 1983 140 p refs
(IPPJ-AM-27) Avail: NTIS HC A07/MF A01

Cross sections were compiled for electron impact excitation of carbon and oxygen ions. A selection was made to recommend best values for use. The resulting recommended values are fitted to an analytical formula and the fitting coefficients are given in a table. The cross sections (in the form of collision strengths) and the rate coefficients calculated therefrom are shown graphically. The reliability of the recommended data is roughly estimated. Author

N83-36926# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ANGULAR DEPENDENCE OF SPUTTERING YIELDS OF MONATOMIC SOLIDS
Y. Yamamura (Okayama Univ. of Science, Japan), Y. Itikawa, and N. Itoh Jun. 1983 116 p refs
(IPPJ-AM-26) Avail: NTIS HC A06/MF A01

The angular dependence of sputtering yield of light ion sputtering and heavy ion sputtering was investigated in detail. Light ion sputtering is due mainly to collision cascades created by ions backscattered from the interior of the solid. The heavy ion sputtering is due to collision cascades generated by incoming ions directly. An empirical formula was proposed and compared with available experimental data of various ion-target combinations, and found to be agreeing in a wide range of the angle of incidence. Author

N83-36927# Office of Naval Research, London (England).
ULTRAVIOLET AND X-RAY SPECTROSCOPY OF ASTROPHYSICAL AND LABORATORY PLASMAS
R. D. Bleach (NRL, Washington, D.C.) 16 May 1983 7 p
(AD-A130741; ONRL-C-8-83) Avail: NTIS HC A02/MF A01 CSCL 07/4

An International Astronomical Union Meeting, Ultraviolet and X-ray Spectroscopy of Astrophysical and Laboratory Plasmas, was held on the Belfield Campus of the Univ. of Dublin, Ireland, from 30 August through 1 September 1982. Over 80 scientists from 13 countries in the astronomical, plasma, and atomic physics communities participated in an exchange of both theoretical and experimental research. It is significant that such an exchange took place at this time because short-wavelength astrophysical satellite-borne experiments are producing data that can be directly compared with results from high-temperature plasma spectroscopy in the laboratory. The comparison provides a broad data base to check the validity of theoretical models, particularly in the case of highly ionized atoms. Author (GRA)

N83-36928# Mission Research Corp., Alexandria, Va.
EXPERIMENTS ON THE DYNAMICS AND HYDRODYNAMIC INSTABILITIES OF ABLATIVELY ACCELERATED TARGETS
Feb. 1983 230 p refs Sponsored in part by DOE and DNA
(Contract N00014-81-C-2046)
(AD-A130408; AD-E001441; MRC/WDC-R-050) Avail: NTIS HC A11/MF A01 CSCL 20/9

Experiments on pressure and velocity of accelerated foils were conducted using the double foil technique or actual laser foil experiments. The x ray tracer technique was investigated to determine if it is suitable to track plasma flow from targets accelerated from high velocities and/or for the study of plasma hydrodynamic instabilities. Plasma calorimeter and ion collectors were used to investigate laser absorption in long density scale length plasmas. Software was developed for investigating the properties of laser interaction with matter. GRA

N83-36929# United Technologies Corp., East Hartford, Conn.
THEORETICAL STUDIES OF KINETIC MECHANISMS OF NEGA-

TIVE ION FORMATION IN PLASMAS Final Technical Report, 15 Jan. 1981 - 15 Jan. 1983
H. Harvey Michels and Robert H. Hobbs Mar. 1983 30 p refs
(Contract F49620-81-C-0022; AF Proj. 2301)
(AD-A129832; AFOSR-83-0576TR; UTRC/R83-925499) Avail: NTIS HC A03/MF A01 CSCL 20/9

This technical program constitutes a theortical research investigation of the kinetic mechanisms of negative ion formation in plasmas. This study was directed toward elucidating the mechanisms of the most important volume-dependent reactions that occur in hydrogen-ion, H-(D-), source devices, primarily of the Belchenko-Dimov-Dudnikov (BDD) type. The primary goal of this research program was to identify the most important reactions leading to H-(D-) production or destruction and to estimate these reaction rates as function of system parameters such as density, composition and temperature. A further goal was to explore new chemical sources for the production of light mass negative atomic ions. The results of this program furnish data and provide direction for more detailed investigations into the kinetics of both gas phase and gas-surface reaction rates of importance in ion source devices and provide input for reliable modeling of such systems. This investigation was carried out using quantum mechanical mehtods. both ab initio and density functional approaches were employed in these studies. GRA

N83-36930# Naval Research Lab., Washington, D. C. Laser Plasma Branch.
PROSPECTS FOR OPTICAL PROBING OF THE RAYLEIGH-TAYLOR INSTABILITY IN ABLATIVELY-ACCELERATED FOIL TARGETS Progress Report
J. A. Stamper, S. P. Obenschain, B. H. Ripin, E. A. McLean, J. Grun (Mission Research Corp., Alexandria, Va.), and M. J. Herbst 21 Jun. 1983 15 p refs
(Contract DE-AI08-79DP-40092)
(AD-A129723; DE83-013702; NRL-MR-5093) Avail: NTIS HC A02/MF A01 CSCL 20/9

Optical probing of non-uniformities is promising as a diagnostic of the Rayleigh-Taylor (R-T) instability. A study was made on an ablatively accelerated target which was designed to provide known initial conditions for the growth of the instability. Two diagnostic techniques were simultaneously used. A side-on, dark-field shadowgram (third harmonic) showed periodic structure in the steep-gradient region on the rear side of the accelerating target. The angular scatter pattern (second harmonic probe) from the front side was consistent with an expected periodic structure in the high-density region. Author (GRA)

N83-36931*# Naval Research Lab., Washington, D. C. Plasma Radiation Branch.
DIELECTRONIC RECOMBINATION RATES, IONIZATION EQUILIBRIUM, AND RADIATIVE EMISSION RATES FOR Mn IONS IN LOW-DENSITY HIGH-TEMPERATURE PLASMAS Interim Report
V. L. Jacobs and J. Davis 23 Jun. 1983 21 p refs Sponsored in part by NASA
(RR0110941)
(NASA-CR-173087; NAS 1.26:173087; AD-A129758; NRL-MR-5105) Avail: NTIS HC A02/MF A01 CSCL 20I

The analysis of optically-thin far-ultraviolet and X-ray emission lines of multiply-charged ions is one of the basic methods for determining the temperatures and densities of laboratory and astrophysical plasmas. In addition, the energy balance in these plasmas can be significantly influenced by the emission of radiation from relatively low concentrations of multiple-charged atomic ions. Because the populations of the excited levels are expected to depart substantially from their local thermodynamic equilibrium values a detailed treatment of the elementary collisional and radiative processes must be employed in order to predict the emission line intensities. In this investigation the authors present the results of calculations based on a corona equilibrium model in which a detailed evaluation is made of the dielectronic recombination rate coefficients. The ionization and autoionization following inner-shell electron excitation from each ground state are balanced by direct radiative and dielectronic recombination. The spectral line intensities emitted by the low-lying excited states, which are assumed to undergo spontaneous radiative decay in times that are short compared with the collision time, are evaluated in terms of the corona ionization equilibrium distributions of the ground states and their electron-impact excitation states. GRA

N83-36932# Colorado Univ., Boulder. Dept. of Astro-Physics.
PLASMA WAVE TURBULENCE AND PARTICLE HEATING CAUSED BY ELECTRON BEAMS, RADIATION AND PINCHES Annual Interim Report, 1 Oct. 1981 - 30 Sep. 1982
Martin V. Goldman 1 Jan. 1983 276 p refs
(Grant AF-AFOSR-0022-80; AF Proj. 2301)
(AD-A129320; AFOSR-83-0498TR; CU-1533201) Avail: NTIS HC A13/MF A01 CSCL 20/9

This report covers research performed from 1 Oct 81 through 30 Sep 82 on electron beam excited plasma turbulence and electromagnetic emission, on propagation of intense electromagnetic radiation in the Earth's ionosphere, and on laboratory experiments on particle beams and plasma waves. Author (GRA)

N83-36933# United Technologies Research Center, East Hartford, Conn.
RESEARCH PROGRAM ON FACTORS AFFECTING THE BRIGHTNESS OF ac PLASMA PANELS Final Report, 4 Feb. 1980 - 4 Apr. 1983
William L. Nighan and Carl M. Ferrar Jun. 1983 34 p refs
(Contract DAAG29-80-C-0019)
(AD-A129545; ARO-16525.3-PH; UTRC/R83-925044-2) Avail: NTIS HC A03/MF A01 CSCL 09/4

Under a Contract a fundamental, theoretical and experimental investigation of the factors affecting brightness, color and efficiency of ac plasma panel displays was conducted. Initial emphasis in the program was placed on plasma displays using conventional neon-Penning mixtures. An important finding of this portion of the work was that the brightness and efficiency of such displays are limited to present levels by several fundamental factors. The possibility of using visible excimer molecule fluorescence for displays was subsequently explored, with attention focused on rare gas-halide and rare gas-oxide excimers. Theoretical analysis indicating that such molecules had promise for the development of bright alternate color displays was confirmed experimentally with the observation of blue fluorescence from Xe sub 2 Cl and green fluorescence from XeO emanating from display discharges. In both cases the measured luminance was found to be greater than that of a neon-Penning mixture excited under the same conditions. Author (GRA)

N83-36934# Naval Research Lab., Washington, D. C. Plasma Radiation Branch.
CHARGE-CHARGE CORRELATION FUNCTIONS IN ULTRA DENSE PLASMAS Interim Report
R. Cauble (Berkeley Research Associates, Springfield, Va.), D. B. Boercker (California Univ., Lawrence Livermore Lab.), and P. Kepple 22 Jun. 1983 26 p refs
(Contract W-7405-eng-48; RR0110941)
(AD-A129465; NRL-MR-5104) Avail: NTIS HC A03/MF A01 CSCL 20/9

The general kinetic equation of the charge-charge structure factor of a fully ionized strongly hydrogen plasma is solved in three distinct collision approximations. These structure factors are necessary for the complete description of spectral line profiles in hot dense plasma environments. Equilibrium correlation functions necessary to these solutions are provided by solution of the hypernetter chain integral equation in which an effective pair potential has been used to take into account short-range quantum effects. The results are compared with molecular dynamics simulations of the plasma using the effective pair potential and with a hierarchial approach involving known sum rules.
Author (GRA)

N83-36935# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.

PHAEDRUS TANDEM MIRROR Status Report, Spring 1983
1983 10 p
(Contract DE-AC02-78ET-51015)
(DE83-013432; DOE/ET-51015/T5) Avail: NTIS HC A02/MF A01

During the spring of 1983, the Phaedrus group undertook a major up to air to improve diagnostic capabilities, modify RF antennas and clean up the inner vacuum surfaces of accumulated getter material. This time was also used to analyze more thoroughly our present data base and correlate it with relevant theoretical predictions. A neutral beam build up code has been developed to model RF central stream trapping and heating, neutral gas charge exchange losses with finite gyroradius effects, and beam aiming sensitivity. MHD stability of the central cell stand alone operation has been explained by a radial ponderomotive force which opposes the centrifugal force due to bad field line curvature. First drafts of research papers on RF trapping, electron cyclotron heating, the stand alone mode, and MHD instability studies were completed. All of these papers require more experiments to tie up loose ends but the loose ends were identified more clearly by this process. The remainder of this report will be organized by experimental area, describing in limited detail the status of current research, recent modifications to diagnostic and machine hardware and immediate future experimental objectives. DOE

N83-36936# Oak Ridge National Lab., Tenn.
GASEOUS DIELECTRICS III
Loucas G. Christophorou 1982 584 p refs Presented at the 3rd Conf. on Gaseous Dielectrics, Knoxville, Tenn, 7-11 Mar. 1982
(Contract W-7405-eng-26)
(DE83-006090; CONF-820331) Avail: NTIS HC A25/MF A01

Topics covered at the conference include: basic physics of gaseous dielectrics; basic mechanisms of pre-breakdown; basic mechanisms of breakdown; new gaseous dielectrics; impulse breakdown; time lags and V-t characteristics; surface flashover; decomposition, aging, and bioenvironmental effects; standards and testing; and gas-insulated equipment. Abstracts of individual items from the conference were prepared separately. DOE

N83-36937# Rensselaer Polytechnic Inst., Troy, N. Y. Plasma Dynamics Lab.
SPACE POTENTIAL, TEMPERATURE AND DENSITY PROFILE MEASUREMENTS ON RENTOR
Paul M. Schoch May 1983 177 p refs
(Contract DE-AC02-76ET-53004)
(DE83-015594; DOE/ET-53004/51; RPDL-83-23) Avail: NTIS HC A09/MF A01

Radial profiles of the space potential, electron temperature, and density were measured on RENTOR with a heavy ion beam probe. The potential profile was compared to predictions from a stochastic magnetic field fluctuation theory, using the measured temperature and density profiles. The comparison shows strong qualitative agreement in that the potential positive and the order of T/sub e//e. There is some quantitative disagreement in that the measured radial electric fields are somewhat smaller than the theoretical predictions. To facilitate this comparison, a detailed analysis of the possible errors was completed. Author

N83-36938# California Univ., Livermore. Lawrence Livermore Lab.
NATIONAL MIRROR PROGRAM PLAN
C. A. Gerich Aug. 1982 124 p refs
(Contract W-7405-eng-48)
(DE83-002653; UCAR-10042-82) Avail: NTIS HC A06/MF A01

This Plan is current as of August 1982 The major milestones listed herein represent an aggressive, success oriented program paced primarily by technical results. Consistent with applicable government policies and the overall program planning of the Department's Office of Fusion Energy, this Plan assumes approval of the Mirror Program's next major step beyond MFTF-B, a deuterium-tritium (D-T) burning engineering reactor called the Fusion Power Demonstration facility (formerly the Tandem Mirror Next Step). The near term goal of the tandem mirror program is to lay the scientific and technical groundwork for an economically attractive, D-T fusion reactor design before the end of the 1980s. Construction of the FPD facility based on the tandem mirror could be initiated around 1988. A second phase, complete with a nuclear power blanket demonstration, could be initiated in the mid-1990s, based on nuclear engineering data from a facility such as the Technology Demonstration Facility described below. The outline of an acceptable tandem mirror reactor design was first published in 1981, and will be further developed and described in the Mirror Advanced Reactor Study during FY 1982-1983. DOE

N83-36939# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
INTERNAL MODES IN HIGH-TEMPERATURE PLASMAS Ph.D. Thesis
Geoffrey Bennett Crew Feb. 1983 152 p refs
(Contract DE-AC02-78ET-51013)
(DE83-015424; DOE/ET-51013/80; PFC/RR-83-10) Avail: NTIS HC A08/MF A01

The linear stability of current-carrying toroidal plasmas is examined to determine the possibility of exciting global internal modes. The ideal magnetohydrodynamic (MHD) theory provides a useful framework for the analysis of these modes, which involve a kinking of the central portion of the plasma column. Non-ideal effects are also important, and these are treated for high temperature regimes where the plasma is collisionless. DOE

N83-36940# Los Alamos Scientific Lab., N. Mex.
NEUTRON STREAMING THROUGH STRAIGHT AND SINGLE BEND SLOTS
W. T. Urban Jul. 1983 17 p refs
(Contract W-7405-eng-36)
(DE83-015176; LA-9761-MS) Avail: NTIS HC A02/MF A01

Calculations were performed using the Monte Carlo code MCNP to determine the neutron streaming through various straight and single bend slots in a one meter thick shield. A uniform plane source emitting 14-MeV neutrons with a cosine angular distribution was used in the analyses. The results obtained have direct implications regarding neutron streaming problems that is encountered in the shielding analyses of Tokamak fusion reactors which are constructed from pie shaped shield/vacuum chamber segments. DOE

N83-36941# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering and Health Physics.
TOKAMAK ETR OBJECTIVES, CHARACTERISTICS, AND CRITICAL ISSUES
Weston M. Stacey, Jr. 29 Mar. 1983 12 p refs
(Contract DE-AS05-78ET-52025)
(DE83-009549; GTFR-40) Avail: NTIS HC A02/MF A01

An initial identification of objectives and physical characteristics of a Tokamak engineering test reactor is made, based upon the large body of work that was devoted to the study of such devices over the past decade. The critical technical issues affecting the feasibility and the specification of design concept for a Tokamak engineering test reactor are discussed. DOE

N83-36942# KMS Fusion, Inc., Ann Arbor, Mich.
IMAGE-ENHANCEMENT TOOLS FOR TRACING FRINGE PATTERNS IN HOLOGRAPHIC INTERFEROGRAMS ACQUIRED DURING LASER-FUSION EXPERIMENTS. KMSF-U-1346
Pamela C. Vavra, Garland E. Busch, and Chester L. Shepard 1983 10 p ref Presented at the 27th Ann. Intern. Tech. Symp. on High Speed Photography, Videography and Photonics, San Diego, Calif., 21 Aug. 1983
(Contract DE-AC08-82DP-40152)
(DE83-014833; DOE/DP-40152/T1; CONF-830874-6) Avail: NTIS HC A02/MF A01

A multiframe probing system developed for use in laser fusion experiments quadruples the number of holographic interferograms acquired during each laser shot. In order to handle the increase in quantity of data, improvements over the previous method of

locating fringes using a tablet digitizer were required. Conventional turnkey image enhancement and fringe tracing methods were found to be inadequate due to the noise levels and fringe densities present. A set of interactive adaptive digital image processing tools was developed to help scientists trace fringe patterns in the holographic interferograms. Preliminary results are promising. DOE

N83-36943# Los Alamos Scientific Lab., N. Mex.
PLASMA SIMULATION AND FUSION CALCULATION
B. L. Buzbee 1983 8 p refs Presented at the NATO Advan. Res. Workshop on High-Speed Computation, Julich, West Germany, 20-22 Jun. 1983
(Contract W-7405-eng-36)
(DE83-014165; LA-UR-83-1633; CONF-830685-1) Avail: NTIS HC A02/MF A01

Particle-in-cell (PIC) models are widely used in fusion studies associated with energy research and in certain fluid dynamical studies. Parallel computation is relevant to them because (1) PIC models are not amenable to a lot of vectorization - about 50% of the total computation is vectorized in the average model; (2) the volume of data processed by PIC models typically necessitates use of secondary storage with an attendant requirements for high-speed I/O; and (3) PIC models exist today whose implementation requires a computer 10 to 100 times faster than the Cray-1. Parallel formulation of PIC models for master/slave architectures and ring architectures is discussed. Because interprocessor communication is a decisive factor in the overall efficiency of a parallel system, division of these models into large granules that can be executed in parallel with relatively little need for communication is shown. Measurements of speedup obtained from experiments on the UNIVAC 1100/84 and the Denelcor HEP are also reported. DOE

N83-36944# Arizona Univ., Tucson. Dept. of Nuclear and Energy Engineering.
RAYLEIGH-TAYLOR INSTABILITY AND RESULTING FAILURE MODES OF ABLATIVELY IMPLODED INERTIAL-FUSION TARGETS Final Report
L. Montierth and R. Morse 15 Apr. 1983 22 p refs
(Contract W-7405-eng-48)
(DE83-014838; UCRL-15537) Avail: NTIS HC 02/MF A01

A theory of these instabilities and potential modes of failure caused by them is presented. Discussions are given for the following: small amplitude growth of the outside surface instability; and modes of failure resulting from nonlinear development of the inside surface instability. DOE

N83-36945# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
TWO-DIMENSIONAL AND RELATIVISTIC EFFECTS IN LOWER-HYBRID CURRENT DRIVE
D. Hewett, K. Hizanidis, V. Krapchev, and A. Bers Jun. 1983 34 p refs Presented at the IAEA Technical Committee Meeting on Non-Inductive Current Drive in Tokamaks, Culham, England, 18-21 Apr. 1983
(Contract DE-AC02-78ET-51013)
(DE83-015919; DOE/ET-51013/86; PFC/RR-83-17; CONF-83052-5) Avail: NTIS HC A03/MF A01

New numerical and analytic solutions of the two dimensional Fokker-Planck equation supplemented by a parallel quasilinear diffusion term are presented. The results show a large enhancement of the perpendicular temperature of both the electrons resonant with the applied RF fields and the more energetic electrons in the tail. Both the RF-generated current and power dissipated are substantially increased by the perpendicular energy broadening in the resonant region. In the presence of a small DC electric field the RF current generated is very much enhanced, much more than in a simple additive fashion. In addition, a relativistic formulation of the two dimensional Fokker-Planck quasilinear equation is presented. From conservation equations, based upon this formulation, the characteristics of RF current drive with energetic electrons are derived. The RF-driven current and its figure of merit (I/P/sub d/) increase with the energy of the current-carrying electrons, and their perpendicular, random momentum also increases. DOE

N83-36946# Oak Ridge National Lab., Tenn. Fusion Energy Div.
TEDIT: A COMPUTER CODE FOR STUDYING THE TIME EVOLUTION OF DRIFT INSTABILITIES IN A TORUS
W. I. vanRij and C. O. Beasley, Jr. Jul. 1983 33 p refs
(Contract W-7405-eng-26)
(DE83-014890; ORNL/TM-8234) Avail: NTIS HC A03/MF A01

TEDIT is an initial value program that calculates the time evolution of drift instabilities in a toroidal plasma with shear and in a slab geometry approximation. The electron and ion kinetic equations are advanced in time, with the electrostatic potential phi and vector potential A/sub parallel/ calculated from quasi-neutrality and Ampere's law, respectively. DOE

N83-36947# California Univ., Livermore. Lawrence Livermore Lab.
THE LLNL TMX-U DIAGNOSTICS DATA SYSTEMS
C. P. Parrish and J. F. Clauser 3 Jun. 1983 10 p Presented at the Workshop on Real-Time Operating Systems, Niagara Falls, N.Y., 11-12 Aug. 1983
(Contract W-7405-eng-48)
(DE83-013334; UCRL-89312; CONF-830875-1) Avail: NTIS HC A02/MF A01

The TMX-U data system is a general-purpose system for acquiring, analyzing, and output of TMX-U data, and can also apply to any pulsed controlled thermonuclear experiment. In its present implementation, it routinely acquires 3Mbytes of data per shot at an average rate of one short every 8 minutes. For increased throughput, the system uses 5 CPUs accessing shared disk memory with a capacity of about 500 Mbytes. All acquisition, analysis, and output of data is handled by a collection of standard program modules (processors), which can be linked together to form chained calculations. Processing for various shots may be allowed to overlap, with higher priority results being available quickly, while lower priority results being allowed to lag behind and catch up in natural lulls in the experiment. Selection of tasks (processor invokations) is done independently by each of the 5 CPUs in the system, and each task can run in any suitable CPU. DOE

N83-36948# Oak Ridge National Lab., Tenn.
THE 3-D RESISTIVE MHD CALCULATIONS FOR TOKAMAK PLASMAS: BEYOND THE SIMPLE REDUCED SET OF EQUATIONS
B. A. Carreras, L. Garcia, T. C. Hender, H. R. Hicks, J. A. Holmes, V. E. Lynch, and B. F. Masden 1983 12 p refs Presented at the US/Japan 3-D MHD Workshop, Nagoya (Japan), 8 Mar. 1983
(Contract W-7405-eng-26)
(DE83-014213; CONF-830342-2) Avail: NTIS HC A02/MF A01

Numerical studies of the resistive stability of Tokamak plasmas in cylindrical geometry have been performed using the full set of resistive Magnetohydrodynamic (MHD) equations and an extended version of the reduced set of resistive MHD equations including diamagnetic and electron temperature effects. The nonlinear interaction of tearing modes of many helicities was investigated. The numerical results confirm many of the features uncovered previously using the simple reduced equations. DOE

N83-36274# Hokkaido Univ., Sapporo (Japan).
QUICK MEASUREMENT OF PLASMA BY LANGMUIR PROBE
Fumiyuki Fujita, Ken Nakajima, and Hatsuo Yamazaki *In its* Bull. of the Fac. of Eng., Hokkaido Univ., No. 115 Jul. 1983 p 81-88 refs In JAPANESE; ENGLISH summary (For primary document see N83-36265 24-31)
Avail: NTIS HC A05/MF A01

N83-36308*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PLASMA EFFECTS
J. W. Armstrong *In its* The Deep Space Network: A Radio Commun. Instr. for Deep Space Exploration 15 Jul. 1983 15 p

refs (For primary document see N83-36302 24-32)
Avail: NTIS HC A09/MF A01 CSCL 17I

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N83-36949# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
METHOD FOR THE FORMATION OF OHMIC CONTACTS ON DIAMOND CRYSTALS
V. F. Ivanov 1982 4 p refs Transl. into ENGLISH from Adgezija Rasplavov Paika Materialov (USSR), v. 4, 1979 p 92-93
(CSIR-Trans-1638) Avail: NTIS HC A02/MF A01

Connection of the diamond with the current supply was carried out at this temperature in an argon atmosphere or in a 5.10 to the-5th power mm vacuum. The molten titanium etches the diamond surface, and a carbide layer is formed on the interface boundary. The thickness of the layer is determined by the temperature, duration of presence and quantities of the active carbide-forming components. In order to obtain good contact quality the thickness of new phase layer is kept below 1 micron and the auxiliary charge carriers are injected into imperfections in the layer structure. The samples are maintained at the maximum temperature for 1 to 2 min in order to avoid disintegration of the low-ohmic semiconducting diamond crystals. The supply contact adhesion obtained is rather good (mechanical strength ca 7 kg/sq mm). N.W.

N83-36950# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
METASTABLE CRYSTALLIZATION OF NATURAL DIAMONDS FROM THE FLUID PHASE
N. S. Nikolskii 1982 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk, Minerologia (USSR), v. 256, no. 4, 1981 p 954-958
(CSIR-Trans-1656) Avail: NTIS HC A02/MF A01

The composition of the fluid phase was determined at f sub O sub 2 and confirmed by the magnetite-wurtzite equilibrium. The results of the calculations indicated that of equilibrium with 01 sub 5 under reducing conditions in the iron stability range, the fluid phase has a hydrogen-methane composition and the increase in CO content is observed only near the graphite stability boundary. The increase in the oxidizing potential to the magnetite-wurtzite equilibrium level in the liquid considerably increases the quantities of oxidizing gases. N.W.

N83-36951# Council for Scientific and Industrial Research, Pretoria (South Africa).
EPR SPECTRA OF DIAMONDS GROWN ON NICKEL IRRADIATED BY CARBON IONS
E. S. Demidov et al 1982 4 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR Neorg. Mater. (USSR), v. 17, no. 7, 1981 p 1307-1308
(CSIR-Trans-1652) Avail: NTIS HC A02/MF A01

In order to obtain better displacement of the reaction in favor of the formation of the diamond form of carbon, epitaxial growth was carried out on a nickel base previously exposed to carbon ions. The disproportionate carbon monoxide reaction was used as the source of carbon: 2CO - CO2 + C. At the end of the experiment an approx. 220 micron diamond layer was formed; this was then mechanically separated from the base and broken into separate black crystals. The diffraction lines on the powdergram of the epitaxial diamonds coincided with those of the diamonds obtained at high pressure. In the case of the epitaxial diamonds, however, noticeable line weakening is observed, indicating defective crystal structure. The diamond properties were investigated by electronic paramagnetic resonance (EPR). Measuring was carried out using a 3 cm spectrometer at 80 and 300 K and at various superhigh frequencies. The first derivative adsorption line was recorded. For purposes of comparison, monocrystals of natural diamonds were also investigated. N.W.

N83-36952# Brown Univ., Providence, R. I. Materials Research Lab.
(?) MATERIALS SCIENCE RESEARCH IN PLASTICITY OF SOLIDS, FRACTURE OF SOLIDS, INORGANIC GLASSES AND SOLID SURFACES Annual Technical Report, 1 Jul. 1981 - 30 Jun. 1982
30 Jun. 1982 98 p
(Grant NSF DMR-79-235701)
(AD-A125259) Avail: NTIS HC A05/MF A01 CSCL 20/12

This Annual Technical Report of the Materials Research Laboratory presents accomplishments achieved from 1 July 1981 through 30 June 1982. Subjects discussed are: plasticity of solids, fracture of solids, inorganic glasses, solid surfaces, lower dimensionality materials and structurres, properties of materials at low temperatures, and materials for solar energy conversion. L.F.M.

N83-36953# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
SINGLE CRYSTAL GROWTH OF POTASSIUM LITHIUM NIOBATE FOR SAW APPLICATIONS Final Report, 30 Jun. 1981 - 29 Jun. 1982
R. R. Neurgaonkar Oct. 1982 29 p refs
(Contract F49620-81-C-0005; AF Proj. 2306)
(AD-A126373; AFOSR-83-0145TR) Avail: NTIS HC A03/MF A01 CSCL 20/2

The growth of good quality, crack free medium size KLN single crystals using the Czochralski method, with dielectric and piezoelectric properties comparable or superior to the best known bronze composition SBN was demontrated. However, large (> 1 cm diameter) KLN crystals suitable for SAE Surface Acoustic Waves characterization without considerable cracking were not grown. Therefore, in pursuit of alternative bronze compositions with the potential for large crystal growth, work was initiated or, the growth and characterization of PBN and the stuffed bronze BSKNN. Initial characterization work shows both of these materials to be very promising for future SAW device development, and good quality single crystals of BSKNN with > 1 cm square cross-section already were successfully grown. The physical properties of PBN and BSKNN also make them of interest for other piezoelectric, electro-optic, and nonlinear optic applications in addition to SAW devices. GRA

N83-36954# Mindlin (Raymond D.), Ridgefield, Conn.
FREQUENCIES OF PIEZOELECTRICALLY FORCED VIBRATIONS OF ELECTRODED DOUBLY ROTATED, QUARTZ PLATES Technical Progress Report, 1 Jun. 1982 - 31 May 1983
30 May 1983 44 p refs
(Contract N00014-80-C-0559; NR Proj. 064-643)
(AD-A128659; RDM/TR-83/1; TR-2) Avail: NTIS HC A03/MF A01 CSCL 20/2

Two-dimensional equations of motion of piezoelectric crystal plates, obtained from the three-dimensional equations of linear piezoelectricity by expansion in power series of the thickness coordinate of the plate, are solved for forced vibrations of electroded SC-cut quartz plates. Results of computations are given for frequencies of simple thickness modes of vibration, for the dispersion of straight-crested waves and for frequencies of vibration of a strip. Author (GRA)

N83-36955# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH Quarterly Technical Summary Report, 1 Aug. - 31 Oct. 1982
Alan L. McWhorter 15 Nov. 1982 105 p refs
(Contract F19628-80-C-0002; AF PRoj. 649L)
(AD-A128982; ESD-TR-82-105; Rept-1982-4) Avail: NTIS HC A06/MF A01 CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 August through 31 October 1982. The topics covered are Solid

State Device Research, Quantum Electronics, Materials Research Microelectronics, and Analog Device Technology. Funding is primarily provided by the Air Force, with additional support provided by the Army, DARPA, Navy, NASA, and DOE. GRA

N83-36956# Princeton Univ., N. J. Dept. of Civil Engineering.
IN-PLANE ACCELERATIONS AND FORCES ON FREQUENCY CHANGES IN DOUBLY-ROTATED QUARTZ PLATES Final Report, 1 Feb. 1979 - 31 Jan. 1983
P. C. Y. Lee and Kuang-Ming Wu Apr. 1983 57 p refs
(Contract DAAG29-79-C-0019)
(AD-A128743; ARO-15648.6-EL; RR-83-SM-6) Avail: NTIS HC A04/MF A01 CSCL 20/2

Two dimensional equations of motion of doubly-rotated quartz plates for the thickness-shear, flexure, and extensional vibrations under in-plane initial stresses are employed to predict changes in the fundamental thickness-shear frequencies due to initial stresses. Two types of initial stresses are considered: stresses due to a pair of diametral forces, and stresses due to steady accelerations for a three-point T shaped mount and a four-point + shaped mounted configurations. Force sensitivity and acceleration sensitivity coefficients are computed and compared with experimental data and existing computed results. For both T shaped and + shaped mount configurations, mount orientations corresponding to the maximum and minimum of acceleration sensitivity are predicted. GRA

N83-36957# California Inst. of Tech., Pasadena.
CRYSTAL GROWTH IN SUBSTRATE-CONFINED LIQUIDS Final Technical Report, 15 Jun. 1981 - 31 Mar. 1983
J. O. McCaldin 31 Mar. 1983 8 p refs
(Contract MDA903-81-C-0354; ARPA Order 4284)
(AD-A128730) Avail: NTIS HC A02/MF A01 CSCL 20/2

The task objective was development of crystal growth techniques utilizing substrate-confined liquids, with emphasis on crystals for photodetection. Various techniques were developed, which were successful in growing arrays of metallic crystals such as In and Sb on inert (i.e., non-epitaxial) substrates. These techniques have not yet been successful, however, in growing crystals of the emphasized semiconducting materials, such as InSb or CdTe. Author (GRA)

N83-36958# Hughes Research Labs., Malibu, Calif. Beam Processing Sect.
ION IMPLANT DAMAGE REGROWTH AND CHARACTERIZATION, AND DEPTH DISTRIBUTION OF DEFECTS AND IMPURITIES IN PROTON-IMPLANTED GaAs Research and Development Status Report, 10 Feb. - 9 Aug. 1982
R. G. Wilson 31 Dec. 1982 16 p refs
(Contract N00014-81-C-0286; ARPA Order 4140)
(AD-A128695) Avail: NTIS HC A02/MF A01 CSCL 20/12

Cr and 0 together have been implanted into damaged (amorphised) and crystalline GaAs and annealed some of the material at 830 degrees C for 20 min. Annealed and unannealed samples have been SIMS profiled for Cr and for O. All are now being analyzed by TEM by Sadana at UC Berkeley. When the TEM results are available, the work will be reported. GRA

N83-36959# Illinois Univ., Urbana. Lab. for Materials Research.
X-RAY TOPOGRAPHY OF HYDRIDE DOMAINS
S. R. Stock, R. Chasnov, H. Chen, and H. K. Birnbaum Apr. 1983 11 p refs
(Contract N00014-75-C-1012)
(AD-A128690) Avail: NTIS HC A02/MF A01 CSCL 07/4

X-ray topographic techniques were applied to the study of twin related domains in niobium hydride and deuteride crystals. It was shown that contrast between the domains results from the small differences in orientation. The procedure has the advantages of not requiring as careful surface preparation as required by optical methods and of being a relatively rapid technique. The method can be applied to any of the single crystal hydrides. Author (GRA)

N83-36960# Cambridge Univ. (England). Dept. of Physics.
NOVEL TRANSPORT AND RECOMBINATION PROCESSES IN SEMICONDUCTORS Annual Technical Report, Mar. 1982 - Mar. 1983
M. Pepper Mar. 1983 67 p refs
(Contract DAJA37-82-C-0181; DA Proj. 1l1-61102-BH-57)
(AD-A130674) Avail: NTIS HC A04/MF A01 CSCL 20/12

This report contains descriptions of our work on two dimensional transport in Si and InP devices and spin dependent recombination in Si gate controlled p-n junctions. The two dimensional work covers our investigations of the quantum Hall effect where we find that the effect is basically d.c. and can be measured by the application of a finite frequency. The cause of this effect is discussed in terms of a delocalisation of electrons in the trials of Landau levels. The experiments indicate that localisation in the tails of Landau levels is caused by both disorder and the electron-interaction. Another aspect of the electron-electron interaction which has been investigated is the oscillatory conductance in inversion layers when charge is present at the Si-Si02 interface. It is suggested that Coulomb effects give rise to a contribution to the activation energy which oscillates with carrier concentration. Other topics in two dimensions which are discussed include the role of spin-orbit coupling in transport in the InP inversion layer and an investigation of the scaling theory of conduction. GRA

N83-36961# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
THE QUARTZ ENVELOPE HEATER: A NEW HEATING TECHNIQUE FOR MOCVD SYSTEMS
S. I. Boldish, J. S. Ciofalo, and D. H. Barker 16 May 1983 15 p refs
(Contract F04701-82-C-0083)
(AD-A130113; TR-0083(3925-01)-1; SD-TR-83-31) Avail: NTIS HC A02/MF A01 CSCL 13/1

The quartz envelope heater, a new heating apparatus designed specifically for metal organic chemical vapor deposition, is described. Discussed as well are its advantages over traditional heating techniques, such as RF induction heating and quartz lamp heating. The apparatus also has more general application to any chemical vapor deposition system which requires a single temperature zone to a maximum of 800 C and which does not contain reactants that chemically attack quartz glass. GRA

N83-36962# Naval Research Lab., Washington, D. C. Condensed Matter and Radiation Science Div.
CONTRIBUTIONS TO THE THEORY OF THE PROPERTIES OF HYDROGENATED AMORPHOUS SILICON Final Report
D. A. Papaconstantopoulos and W. E. Pickett 21 Jul. 1983 67 p refs
(RR0210201)
(AD-A130419; NRL-MR-5129) Avail: NTIS HC A04/MF A01 CSCL 20/12

This report presents a theoretical study of the electronic properties of hydrogenated amorphous silicon, a material which is now used in the manufacturing of solar cells as an alternative to crystalline silicon. GRA

N83-36963# Xerox Palo Alto Research Center, Calif. General Sciences Lab.
DYNAMIC PROPERTIES OF ELECTRONIC TRAPPING CENTERS AT THE Si-SiO2 INTERFACE Final Report
N. M. Johnson May 1983 39 p refs
(Contract DAAK20-81-C-0406)
(AD-A130406) Avail: NTIS HC A03/MF A01 CSCL 20/12

On unannealed, thermally oxidized silicon, electron spin resonance reveals an oriented interface defect which is termed the Pb center and identified as the trivalent silicon defect. Deep-level transient spectroscopy (DLTS) reveals two broad characteristic peaks in the interface-state distribution: one approximately 0.3 eV above the silicon valence-band maximum, and a second approximately 0.25 eV. below the conduction band. Isochronal anneals of oxidized silicon, coated with aluminum, show

that the spin density and the densities of the two DLTS peaks have the same annealing kinetics. On large-area, Al-gated capacitors the spin density can be modulated with an applied voltage; sweeping the silicon bandgap at the interface through the Fermi level reveals that the spin density is approximately constant over the central region of the bandgap but decreases near the band edges. The variation of the spin density with gate voltage identifies an amphoteric center with both electronic transitions in the bandgap. Both the annealing behavior and the voltage dependence of the Pb center support the conclusion that these transitions correspond to the two characteristic peaks in the effective correlation energy of the dangling orbital on a trivalent silicon defect at the Si-SiO2 interface. The similarity between the disordered interface and amorphous silicon and the effects of a correlation energy on deep-level measurements are discussed.
Author (GRA)

N83-36964# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Laser and Optical Materials Branch.
CHARACTERIZATION OF SILICON GROWN BY COLD CRUCIBLE TECHNIQUES Interim Technical Report, Jan. 1981 - Sep. 1982
David W. Fischer, John J. Rome, Timothy L. Peterson, and Melvin C. Ohmer Apr. 1983 31 p refs
(AF Proj. 2306)
(AD-A129822; AFWAL-TR-83-4015) Avail: NTIS HC A03/MF A01 CSCL 20/2

Single crystal silicon grown by the cold crucible technique has been characterized by Fourier transform infrared (FTIR) spectroscopy, Hall effect, and etching. Boron, phosphorus, carbon, and oxygen were the only impurities observed. At 10K, FTIR data indicated oxygen concentrations in the low-to mid- ten to the 15th power per cu cm range and carbon concentations in the midten to the 16th power to low ten to the 17th power per cu cm range. Asorption and Hall data are in close agreement on the born concentration (ten to the 15th power per cu cm) which seems to be significantly higher in the cold crucible crystals than in the opoy-crystalline silicon starting material. This indicates that boron is being added during the growth process. The oxygen concentration in the cold crucible material is significantly lower than in conventional Czochralski-grown material. The Hall mobility of the cold crucible samples is in the normal range (315-350 sq cm/volt-sec), the resistivity varied from about 12 to 22 ohm-cm and the defect density was high (1000). Further development of cold crucible growth technique is recommended. GRA

N83-36965# Scientific Research Associates, Inc., Glastonbury, Conn.
SEMICONDUCTOR MATERIALS FOR HIGH FREQUENCY SOLID STATE SOURCES Quarterly Report
Harold L. Grubin May 1983 5 p
(Contract N00014-82-C-0697; ARPA Order 4599)
(AD-A129767; SRA-R920016-2) Avail: NTIS HC A02/MF A01 CSCL 20/12

The purpose of this theoretical study is to provide guidelines for high frequency millimeter wave semiconductor materials selection. The theoretical methods used in the study are more general than those used in earlier studies in that transient nonequilibrium contributions are included. The results are directly applicable to submicron technology. In the study, material parameters are identified through band structure and phonon dispersion curve calculations; and transport explicitly includes electron-phonon interactions as well as impurity scattering. Carrier velocity and time dependent currents are obtained through solutions to the first three moments of the Boltzmann transport equation. In the last reporting period a simple set of scaling rules were applied to the scattering rates of gallium arsenide. The scattering rates were doubled and halved. It was demonstrated that the response times for a scaled applied field were respectively halved and doubled. The upper frequency limit was anticipated as higher for the more rapid scattering rate. GRA

N83-36966# EIC, Inc., Newton, Mass.
GROWTH OF Ce(+3) DOPED OXIDES BY THE TRAVELING SOLVENT ZONE TECHNIQUE Final Report, 2 Aug. 1982 - 1 Apr. 1983
R. David Rauh, Kenneth D. Brady, Tom A. Kavassalis, and David H. Longendorfer Jun. 1983 44 p refs
(Contract N00014-82-C-0629; NR Proj. 379-056)
(AD-A130566; C-718F) Avail: NTIS HC A03/MF A01 CSCL 20/2

Preliminary experiments have been carried out to determine the feasibility of flux growth of Ce(+3) doped La(Al,Sc)O3 using the traveling solvent zone technique. In particular, a new cubic host lattice, LaA10.7ScO.303, was prepared by arc furnace techniques and found to have expanded lattice dimensions compared to LaA1O3. The mixed perovskite has a more ideal A:B radius ratio than LaA1O3, perhaps promoting more ideal cubic symmetry. GRA

N83-36967# Rockwell International Science Center, Thousand Oaks, Calif. Microelectronics Research and Development Center.
THE 1.27 MICROMETERS RECEIVER DEVELOPMENT Final Technical Report, 18 Jun. 1979 - 17 Jun. 1980
H. D. Law, P. D. Dapkus, and K. Nakano Griffiss AFB, N.Y. RADC Mar. 1983 93 p refs
(Contract F19628-79-C-0143; AF Proj. 4600)
(AD-A129277; MRDC41031.5FR; RADC-TR-83-66) Avail: NTIS HC A05/MF A01 CSCL 17/5

This program addressed performance improvements of GaAlAsSb avalanche photo-diodes and low noise GaAs MESFET transimpedance amplifier for 1.3 micron fiber optic hybrid receiver applications. Although material non-uniformity and device surface leakage problems require further work, GaAlAsSb is a most attractive lattice-matched 1.3 to 1.55 micron APD material with high gains, quantum efficiencies, and speeds exhibited in a variety of device structures. The GaAs monolithic preamplifier investigated in the program, capable of frequency operation is excess of 1 GHz with appropriate transimpedance, is an ideal front end for a fiber optic communication receiver or an APD array. Author (GRA)

N83-36968# Massachusetts Inst. of Tech., Cambridge. Lab. of Electronics.
NON-LINEAR OPTICAL INTERACTIONS IN SEMICONDUCTORS Final Report, 1 Apr. 1979 - 31 Mar. 1983
M. M. Salour Apr. 1983 15 p refs
(Contract F49620-79-C-0071)
(AD-A129995; AFOSR-83-0584TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

The first tunable CW laser action in both mode-locked and unmode-locked (in both straight and ring cavity) configurations has been demonstrated. The gain media were platelets of CdS, CdSe, InGaAsP, and HgCdTe. Pulse as short as 2.8 Psec and continous tunability between .5 micrometers and 2.5 micrometers has been achieved. Picosecond spectroscopy of bound excitons, using a synchronously operating streak camera; and picosecond photoelectric emission from a Zirconium metal surface have been studied. The first experimental technique for compensating the pulse broading in single-mode optical fibers using the slow anomalous pulse propagation in the exciton-polariton resonance in a Direct-gap semiconductor has been demonstrated.
Author (GRA)

N83-36969# Dayton Univ., Ohio.
MEASUREMENT AND THEORY OF THE HALL SCATTERING FACTOR AND THE CONDUCTIVITY MOBILITY IN ULTRA PURE p-TYPE SILICON AT LOW TEMPERATURES Interim Technical Report, 1 Sep. 1981 - 31 Mar. 1983
Frank Szmulowicz, W. Mitchel (AFWAL), Frank L. Madarasz, and Patrick M. Hemenger (AFWAL) Wright-Patterson AFB, Ohio AFWAL Apr. 1983 98 p refs
(Contracts F33615-81-C-5095; F33615-78-C-5064; AF Proj. 2306)
(AD-A130021; AFWAL-TR-83-4043) Avail: NTIS HC A05/MF A01 CSCL 20/12

Acoustic phonon-limited conductivity and Hall mobilities for p-type silicon and germanium have been calculated from solutions of the full Boltzmann equation without the relaxation time approximation. These quantities have been measured as well for p-type silicon in the temperature range 20-50K. Using the deformation potential scattering theory of Tiersten we obtain the necessary hole-acoustic phonon transition rates, with no adjustable parameters, as a first principles input to the transport equations. Excellent agreement is found for both mobilities with our experimental data on silicon. Calculated results were compared with data from the open literature on germanium and similar agreement is found for the conductivity mobility. The success of this calculation is due to the inclusion of all three top valence bands, careful treatment of the scattering matrix elements, and the use of the full Boltzmann equation solutions to obtain the transport coefficients. Results of our calculation confirm the quantitative accuracy of the deformation potential theory. Author (GRA)

N83-36970# Texas Univ., Austin. Dept. of Physics.
HIGH RESOLUTION ELECTRON ENERGY LOSS STUDIES OF CHEMISORBED SPECIES ON ALUMINUM AND TITANIUM Final Report, 1 Apr. 1980 - 31 Mar. 1983
J. L. Erskine 1983 8 p
(Grant AF-AFOSR-0154-80; AF Proj. 2303)
(AD-A129204; AFOSR-83-0471TR) Avail: NTIS HC A02/MF A01 CSCL 07/2

This report summarizes significant accomplishments and research progress achieved during the last three years under grant AFOSR-80-0154. The overall project objective was to apply high-resolution electron-loss-spectroscopy to the study of chemisorbed species on aluminum and titanium surfaces. Pursuant to this objective, a suitable spectrometer was constructed which incorporates the necessary sample preparation and characterization capabilities including low energy electron diffraction and Auger electron spectroscopy in addition to a state-of-the-art electron energy loss spectrometer. This instrument has been used to study several chemisorbed systems including oxygen on aluminum, oxygen on nickel and hydrogen on tungsten. The primary scientific results of this program to date have been published and have been described in the four interim reports to AFOSR. Significant results include: electron energy loss studies of oxygen on aluminum which establish the simultaneous formation of overlayer and underlayer oxygen during initial oxidation, demonstration of the applicability of lattice-dynamical modeling to interpretation of energy loss data in order to test structural models, and observation of the first azimuthal pattern for impact scattering in electron energy loss studies of hydrogen on tungsten. GRA

N83-36971# Rockwell International Science Center, Thousand Oaks, Calif.
FERROELECTRIC TUNGSTEN BRONZE BULK CRYSTALS AND EPITAXIAL THIN FILMS FOR ELECTRO-OPTIC DEVICE APPLICATIONS Semiannual Technical Report, 30 Sep. 1982 - 31 Mar. 1983
R. R. Neurgaonkar and L. E. Cross May 1983 53 p refs
(Contract N00014-82-C-2466; DARPA Order 4540)
(AD-A129351; SATR-1) Avail: NTIS HC A04/MF A01 CSCL 20/6

One -3 cm diameter single crystals of the bronze compositions SBN:50 and SBN:60 have been successively grown. Optical striations in SBN:60 are found to arise from impurities and temperature instability during growth. Improvements in temperature stability, rotation rate, and post-annealing conditions have improved the optical quality considerably. LPE growth of SBN:48 on SBN:60 and SBN:50 single crystal substrates has been successful, with crystal films of 10-15 micrometers in thickness grown. Piezoelectric and electro-optic measurements have been performed on PBN and SBN single crystals. Electro-optic g and r coefficients are shown to be easily determined from measurements of the birefringence delta n31. The linear coefficients are particularly promising for both PBN and SBN. GRA

N83-36972# Sandia Labs., Albuquerque, N. Mex.
THEORETICAL STUDIES OF STRAINED-LAYER SUPERLATTICES
G. C. Osbourn 1983 2 p refs Presented at the 5th SERI Photovoltaic Adv. Res. and Development Ann. Review Meeting, Denver, 19 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-012495; SAND-83-1210C; CONF-830551-1) Avail: NTIS HC A02/MF A01

Strained layer superlattices (SPS) form a broad new class of materials with potential photovoltaic applications. These are high quality superlattices grown from lattice-mismatched materials when the individual superlattice layers are kept thin and the lattice mismatch is totally accommodated by coherent strains in the layers. Theoretical results are briefly discussed for the GaAsP and InGaAs SPS systems. DOE

N83-36973# Sandia Labs., Albuquerque, N. Mex.
CHEMICALLY INDUCED INTERFACE STATES ON SEMICONDUCTOR ELECTRODES
M. A. Butler and D. S. Ginley 1983 10 p refs Presented at the 163rd Electrochem. Soc. Meeting, San Francisco, 8 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-013265; SAND-83-1314C; CONF-830508-21) Avail: NTIS HC A02/MF A01

Sub-bandgap photocurrent spectroscopy has been used to observe interface states on GaP surfaces induced by treatment with various metal ions. In particular, Ru treatment induces a discrete level near the center of the gap which improves the ability of the electrode to evolve hydrogen. Such behavior is interpreted in terms of catalyzing the hydrogen evolution reaction rather than changing the surface recombination velocity as is observed in n-GaAs. Comparison of the effects of various ions suggests that the mechanism for generation of the interface states is the same as result in Fermi level pinning during Schottky barrier formation. DOE

N83-36974# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.
SYNTHESIS OF REFRACTORY-OXIDE MATERIALS BY SKULL MELTING
Claude C. Herrick and Robert G. Behrens 1983 7 p refs Presented at the 163rd Electrochem. Soc. Meeting, San Francisco, 8-13 May 1983
(Contract W-7405-eng-36)
(DE83-012676; LA-UR-83-1348; CONF-830508-19) Avail: NTIS HC A02/MF A01

Skull melting is a cold-crucible technique for obtaining high-purity melts of refractory materials, particularly oxides. This technique has been used to synthesize high-purity minerals and to prepare single crystals of uraninite (UO_2) and thorianite (ThO_2) directly from the melt. A description of the crystal-growing technique is discussed. Los Alamos is also interested in developing the skull-melting technique to zone-refine spent UO_2 nuclear reactor fuel pins. Since metallic fission products and actinides will behave as solute impurities in a UO_2 solvent, the success of the zone-refining process will depend on the distribution of the impurities between molten and solid UO_2. An effective distribution coefficient for Y_2O_3 segregated between molten and solid UO_2 was experimentally determined by zone melting. An effective distribution coefficient of $k = 0.75 +- 0.05$ was obtained, in good agreement with an equilibrium value of $k0 = 0.06$, estimated from the Y_2O_3-UO_2 phase diagram. DOE

N83-36975# Argonne National Lab., Ill. Materials Science and Technology Div.
CRYSTALLIZATION AND SPECTROSCOPIC CHARACTERIZATIONS OF MEDIUM-PORE ZEOLITES IN THE ALUMINOFERRISILICATE SYSTEM
L. E. Iton and R. B. Beal (Univ. of South Florida) 1983 4 p ref Presented at the 6th Intern. Zeolite Conf., Reno, Nev., 10 Jul. 1983
(Contract W-31-109-eng-38)

(DE83-011714; CONF-830756-3) Avail: NTIS HC A02/MF A01

Results establish the important result that medium-pore alumino-ferrisilicate zeolites can be synthesized, which have the ZSM-5-type structure, and have Fe(3) ions in both framework and non-framework sites. The non-framework cations would therefore serve as charge-balancing cations. DOE

N83-36976# Emory Univ., Atlanta, Ga. Dept. of Physics.
FAR-INFRARED STUDIES OF SUPERCONDUCTING V3Si, Nb3Ge AND Nb, RENEWAL PROPOSAL Progress Report
Sidney Perkowitz 1983 9 p refs
(Contract DE-AS05-79ER-10436)
(DE83-012786; DOE/ER-10436/4) Avail: NTIS HC A02/MF A01

A strong effort has continued in understanding the behavior of the electron-phonon spectral function (-2)/sub tr/F((NU)) as measured in V3Si by far infrared methods. Our result implied two features in (-2)/sub tr/F((NU)) that differed from the neutron scattering results: the existence of a new low energy peak at about 6 MeV and a shift down of the intermediate energy peak from 25 to 18 MeV. Recent work by Mitrovic and Carbotte shows that these increased low energy weights are not needed to explain thermodynamic results for V3Si, yet the far infrared structure which leads to them is quite clear. The apparent resolution of the anomaly may lie in a very recent refinement by Mitrovic of Allen's original theory. The original work assumed a constant electronic density of states but the new version allows this quantity to vary near the Fermi energy. Calculations are now under way to determine whether this factor can explain the observed far infrared data without recourse to additional structure in (-2)/sub tr/F((NU)) itself. If so, Mitrovic's theory will provide the best available model for further analysis in Nb and Nb3Ge as well as in V3Si. Author

N83-36977# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHAOS AND NOISE IN JOSEPHSON TUNNEL JUNCTIONS
John Clarke, Robert F. Miracky, John Martinis, and Roger H. Koch (IBM Watson Research Center) May 1983 12 p refs Presented at the 7th Intern. Conf. on Noise in Phys. Systems, Monpellier (France), 16-20 May 1983
(Contract DE-AC03-76SF-00098)
(DE83-013686; LBL-16127; CONF-830595-1) Avail: NTIS HC A02/MF A01

The current voltage characteristics of Josephson tunnel junctions shunted by a conductance with substantial self-inductance exhibit regions of stable negative resistance are investigated. At certain values of bias current, the junctions exhibit chaos, which is manifested as a low frequency voltage noise equivalent to a noise temperature of about 10(3)K. At other bias points, switching between subharmonic modes or between a subharmonic mode and a chaotic regime produces low frequency noise with a noise temperature often exceeding 10(6)K. Analog simulations indicate that, at least under some conditions, the switching is induced by intrinsic thermal noise. The analog has also been used to show that switching induced by thermal noise is responsible for the noise rise observed experimentally in three-photon Josephson parametric amplifiers. DOE

N83-36978# Colorado State Univ., Fort Collins.
TRANSPORT IN SUBMICRON MOSFETS Final Report
D. K. Ferry 1 Aug. 1983 22 p refs
(Contract DAAG29-80-K-0032)
(AD-A129983; CSU-FR-2; ARO-17592.3-EL) Avail: NTIS HC A02/MF A01 CSCL 09/1

One of the main driving forces in solid-state electronics is the thrust to develop smaller and faster active devices, which dissipate very little power, for eventual use in large-scale integrated circuits. In most situations, however, the actual power-delay product of the device itself is not as important as constraints of charging the interconnection capacitances of the wiring. In this introduction, we show that there is a fundamental lower bound to the delay time itself. This limit arises from the necessity for heat removal, the necessary requirements for signal propagation, as well as the speed-power product itself. At the fundamental limit, the delay time is insensitive to modest variations in the actua' speed-power product. At the opposite extreme, in the wire-dominated chip, the cell size is determined by wiring constraints rather than device constraints and the delay time is also independent of the speed-power product. Author (GRA)

N83-36979# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.
SHOCK-LOADING BEHAVIOUR OF FUSED QUARTZ
L. C. Chhabildas and D. E. Grady 1983 5 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-015106; SAND-83-0802C; CONF-830719-4) Avail: NTIS HC A02/MF A01

Reshock and release experiments performed on fused quartz over the stress range 13 to 21 GPa indicate the onset of a low to high density phase change at 13 GPa. The rapid release structure observed suggests unloading from a frozen mixed phase, while transformation rate effects are believed responsible for the dispersive reshock structure observed. Complete release experiments combined with quenched shock recovery experiments would be useful in addressing kinetics of the reverse phase transformation. DOE

N83-36980# California Univ., Los Angeles. School of Engineering and Applied Science.
SEMICONDUCTOR EUTECTICS FOR ENERGY CONVERSION Final Report
A. S. Yue Apr. 1983 105 p refs
(Contracts DE-AT03-76ER-70259; EY-76-03-0034)
(DE83-014940; UCLA-ENG-83-21) Avail: NTIS HC A06/MF A01

Directionally-oriented two-phase semiconducting eutectics are potential device-materials. A comprehensive search of the literature gives a list of semiconducting eutectic systems. Among these, the SnSe-SnSe2 was chosen for studies in detail. The SnSe-SnSe2 eutectic grown by the Bridgman technique has a multi-P/N-junction lamellar microstructure. Since its plasma frequency has not been detected within the infrared reflectance spectrum up to 40 micrometers of wavelength, it is, therefore, concluded that the SnSe-SnSe2 eutectic is a non-degenerate semiconductor. SnSe single crystals grown from the vapor phase have a hole concentration of 9.72 x 10(17) cm(+3) and a mobility of 154 cm(2)/sec-v at room temperature. This mobility is proportional to T/sup -1/3/ for T < 1300 K and T/sup -2.25/ for T > 1300 K. The index of reflection for SnSe single crystal has been determined froma wavelength of micrometers to a wavelength of 40 micrometers and was found to be 3.120 at 3 microns and 3.095 at 15 microns. A current-voltage characteristic expressed as I = I0 exp (qv/2.08 KT) was measured on a SnSe diode, which exhibits a negative resistance after the breakdown. DOE

N83-36981# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
GRAIN BOUNDARY AND SURFACE DIFFUSION IN OXIDE SYSTEMS
V. S. Stubican 15 Jul. 1983 5 p refs
(Contract DE-AC02-78ER-04998)
(DE83-015572; DOE/ER-04998/T3) Avail: NTIS HC A02/MF A01

The grain boundary diffusion and the effect of anisotropy on the grain boundary diffusion of Cr-51 in alumina and stoichiometric spinel (MgAl2O4) was studied. Bicrystals of Al2O3 and MgAl2O4 were grown and the orientation of grain boundaries was determined with a Lave back reflection camera. DOE

N83-36982# Maryland Univ., College Park. Dept. of Physics and Astronomy.
INFLUENCE OF PRESSURE ON THE FERMI SURFACES OF VANADIUM, RHENIUM AND RHODIUM
J. R. Anderson and J. E. Schirber (Sandia National Labs.) 1983 5 p refs Presented at the 9th AIRAPT Conf., Albany, N.Y., 25 Jul. 1983

(Contract DE-AC04-76DP-00789)
(DE83-014779; SAND-83-1608C; CONF-830763-2) Avail: NTIS HC A02/MF A01

Measurements of the effects of pressure on Fermi surfaces of vanadium, rhenium, and rhodium were carried out at pressures up to 4 kbar using the solid-helium, phase-shift technique. Comparisons between these results and those from similar elements, niobium, cobalt, and palladium, show that pressure is an important parameter for testing Fermi surface models. DOE

N83-36983# Trieste Univ. (Italy). Inst. di Fisica Teorica.
STUDY OF AN F CENTER IN MOLTEN KC1
M. Parrinello and A. Rahman (ANL) May 1983 13 p refs Presented at the Conf. on Monte Carlo Methods in Quantum Problems, Orsay, France, 9-11 Feb. 1983; sponsored by the European Center for Atomic and Molecular Calculations
(Contract W-31-109-eng-38)
(DE83-014736; CONF-830233-1) Avail: NTIS HC A02/MF A01

It is shown that a discretized version of Feynman's path integral provides a convenient tool for the numerical investigation of the properties of an electron solvated in molten KC1. The binding energy and the pair correlation functions are calculated. The local structure around the solute electron appears to be different from that of an F center in the solid. DOE

N83-36984# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF ANALYTICAL MODELS AND EXPERIMENTAL RESULTS FOR SINGLE-EVENT UPSET IN CMOS SRAMS
T. M. Mnich, S. E. Diehl (North Carolina State Univ., Raleigh), and B. D. Shafer 1983 10 p refs Presented at the 20th IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Gatlinburg, Tenn., 18 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013990; SAND-83-1433C; CONF-830714-6) Avail: NTIS HC A02/MF A01

In an effort to design fully radiation hardened memories for satellite and deep space applications, a 16K and a 2K CMOS static RAM were modeled for single particle upset during the design stage. The modeling resulted in the addition of a hardening feedback resistor in the 16K remained tentatively unaltered. Subsequent experiments, using the Lawrence Berkeley Laboratories' 88-inch cyclotron to accelerate krypton and oxygen ions, established an upset threshold for the 2K and the 16K without resistance added, as well as a hardening threshold for the 16K with feedback resistance added. Results for the 16K showed it to be hardenable to the higher level than previously published data for other unhardened 16K RAMs. The data agreed fairly well with the modeling results; however, a close look suggests that modification of the simulation methodology is required to accurately predict the resistance necessary to harden the RAM cell. DOE

N83-36985# Argonne National Lab., Ill. Materials Science and Technology Div.
IN-SITU OBSERVATION OF THE ENERGY DEPENDENCE OF DEFECT PRODUCTION IN Cu AND Ni
Wayne E. King, K. L. Merkel, A. C. Baily, K. Haga, and M. Meshii 1983 7 p refs Presented at the 7th Intern. Conf. on High Voltage Microscopy, Berkeley, Calif., 16 Aug. 1983 Sponsored by NSF Prepared in cooperation with Northwestern Univ., Evanston, Ill.
(Contract W-31-109-eng-38)
(DE83-014208; CONF-830819-2) Avail: NTIS HC A02/MF A01

The damage function, the average number of Frenkel pairs created as a function of lattice atom recoil energy, was investigated in Cu and Ni using in situ electrical-resistivity damage rate measurements in the high voltage electron microscope (HVEM) at $T < 10K$. Electron and proton irradiations were performed in situ on the same polycrystalline specimens using the Argonne National Laboratory HVEM-Ion Beam Interface. Both Ni and Cu exhibit a sharp rise in the damage function above the minimum threshold energy (approx. 18 eV for Cu and approx. 20 eV for Ni) as displacements in the low threshold energy regions of the threshold energy surface become possible. A plateau is observed for both materials (0.54 Frenkel pairs for Cu and 0.46 Frenkel pairs for Ni) indicating that no further directions become productive until much higher recoil energies. These damage functions show strong deviations from simple theoretical models, such as the Modified Kinchin-Pease damage function. The results are discussed in terms of the mechanisms of defect production, that govern the single displacement regime of the damage function and are compared with results from recent molecular dynamics simulations. DOE

N83-36986# Sandia Labs., Albuquerque, N. Mex.
DETERMINATION OF THE DEPTH DISTRIBUTION OF X-RAY GENERATION, PHI (RHO Z), FOR TILTED SPECIMENS OF Au IN THE ANALYTICAL ELECTRON MICROSCOPE
A. D. Romig, Jr., D. E. Newbury, R. L. Mykelbust, and K. W. Bieg 1983 9 p refs Presented at the 18th Ann. Microbeam Analysis Soc. Conf., Phoenix, Ariz., 8 Aug. 1983 Prepared in cooperation with NBS
(Contract DE-AC04-76DP-00789)
(DE83-009932; SAND-83-0118C; CONF-830815-4) Avail: NTIS HC A02/MF A01

Thin film X-ray microanalysis in the analytical electron microscope (AEM) typically assumes the depth distribution of X-ray generation phi(pz) is constant with depth z. If it is necessary to correct the raw X-ray intensity data for absorption, this assumption becomes critical. Phi(pz) was determined experimentally with samples in which Au was placed on a Hf substrate. During the analysis the samples were tilted at 450 with respect to the electron beam. These experimental results were compared to Monte Carlo calculations. Phi(pz) was found to vary with depth in the foil. Simple binary targets are not suitable samples for the determination of phi(pz) curves due to electron backscatter effects. The error in the actual phi(pz) curves and the apparent phi(pz) determined from binary targets can approach 20% (relative). After passing through a maximum, the values of phi(pz) decrease due to a forward scattering effect which occurs in tilted samples. DOE

N83-36987# International Trade Administration, Washington, D.C.
HIGH TECHNOLOGY INDUSTRIES: PROFILES AND OUTLOOKS. THE SEMICONDUCTOR INDUSTRY
1983 33 p
(PB83-211151) Avail: NTIS HC A03/MF A01; also available in set of 4 reports HC E99 as PB83-211128 CSCL 05C

This profile is designed to assess the international competitive position of the U.S. Semiconductor Industry; pinpoint the major foreign and domestic challenges to American semiconductor manufacturers; and present for discussion possible options in terms of U.S. government policies affecting the sector's international standing. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N83-36988# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JOURNAL OF ENGINEERING THERMOPHYSICS (SELECTED ARTICLES)
13 May 1983 70 p refs Transl. into ENGLISH from Gongcheng Rewuli Xuebao (China), v. 2, no. 3, 1981 p 224-261
(AD-A129455; FTD-ID(RS)T-0416-83) Avail: NTIS HC A04/MF A01 CSCL 20/13

Topics covered include: (1) characteristics and instability behavior of an axial compressor in a turbojet engine; (2) prediction of onset of rotating stall using small perturbation theory for axial flow compressors; (3) the principal equation for the aerodynamic calculation of the nonradial calculation station on S2 stream-surface flow in turbomachines; (4) numerical calculation of subsonic

compressible turbulent flow in a conical diffuser; (5) the analysis of forces and powers in turbomachinery gas dynamics; (6) flow-field line relaxation solution for S2 relative stream surface with the splitter boundary condition; (7) the effect of casing treatment on performance of an axial compressor and (8) a calculation method for the rocket engine's optimum thrust nozzle contour design. GRA

N83-36989# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.
THE LINE SHAPE FOR COLLISIONALLY BROADENED MOLECULAR TRANSITIONS: A QUANTUM THEORY SATISFYING THE FLUCTUATION DISSIPATION THEOREM Interim Report
Shepard A. Clough, Richard W. Davies, and Richard H. Tipping 27 Sep. 1982 17 p refs
(AF Proj. 2310)
(AD-A129252; AFGL-TR-82-0281; AFGL-PSRP-659) Avail: NTIS HC A02/MF A01 CSCL 20/10

The dipole autocorrelation function for spectral line broadening is treated in a quantum theory which rigorously satisfies detailed balance on a microscopic level. The approximations involved include the assumption of binary collisions, the neglect of line coupling and the validity of second order perturbation theory. The results are consistent with the impact theory at long times and include the physics of collisions described through an appropriate intermolecular collision potential. Physically realistic trajectories are utilized for the computation of the required matrix elements. The results are shown to be consistent with an analysis of the water vapor continuum. Author (GRA)

N83-36990# Oregon Univ., Eugene. Dept. of Physics.
APPLICATIONS OF QUANTUM FIELD THEORY TO ATOMIC COLLISIONS AND CHEMICAL REACTIONS Renewal Proposal Summary, 1 Jul. 1883 - 30 Jun. 1984
Marvin D. Girardeau Apr. 1983 9 p
(Contract N00014-81-K-0759)
(AD-A129236; QFT-2) Avail: NTIS HC A02/MF A01 CSCL 20/10

Methods of quantum field theory will be applied to prediction of atomic and molecular collision and reaction phenomena. Emphasis will be on (a) reactive collisions such as D+H2yieldD+H+, D+H2yieldD+H+2, and A+BCyieldAB+C; (b) theory of resonance and transition states and their influence on such reactive processes and on scattering processes such as e+Hyielde+h; (c) electromagnetic absorption due to such transition states. GRA

N83-36991# Texas Univ., Austin. Center for Particle Theory.
SPONTANEOUSLY BROKEN SUPERSYMMETRY AND POINCARE INVARIANCE
Xerxes R. Tata, E. C. G. Sudarshan, and Joseph M. Schechter (Syracuse Univ.) Dec. 1982 11 p refs
(Contract DE-AS05-76ER-03992)
(DE83-012929; DOE/ER-03992/505) Avail: NTIS HC A02/MF A01

It is argued that the spontaneous breakdown of global supersymmetry is consistent with unbroken Poincare invariance if and only if the supersymmetry algebra A = 0 is understood to mean the invariance of the dynamical variables phi under the transformations generated by the algebra, i.e., [A, phi] = 0 rather than as an operator equation. It is further argued that this weakening of the algebra does not alter any of the conclusions about supersymmetric quantum field theories that have been obtained using the original (stronger) form of the algebra. DOE

N83-36992# Argonne National Lab., Ill. Chemistry Div.
THERMOCHEMICAL REGULARITIES AMONG LANTHANIDE AND ACTINIDE OXIDES
Lester R. Morss 1983 38 p refs Presented at the 16th Rare Earth Res. Conf., Tallahassee, 18-21 Apr. 1983
(Contract W-31-109-eng-38)
(DE83-014706; CONF-830419-8) Avail: NTIS HC A03/MF A01

The thermochemical properties of binary and complex oxides of the lanthanides and actinides, in terms of other well-characterized species and thermochemical cycles are treated. Since the trivalent lanthanides provide a reference series against which the lanthanide and actinide sesquioxides are compared, the trivalent-ion energetics are considered first. Recent interest in monoxides, prompted by high pressure synthesis of lanthanide monoxides and interest in divalent actinide metals and oxides, has led to inclusion of a treatment of the relative stabilities of monoxides and sesquioxides. The important tetravalent state is viewed from the perspective of the dioxides as well as the perovskites BaMO3. Since there are no higher valent lanthanides, systematic trends in pentavalent and hexavalent complex actinide oxides are not treated in this review. DOE

N83-36993# Puerto Rico Univ., Mayaguez. Dept. of Chemical Engineering.
RECOVERY OF ENTHALPY AS WORK FROM THERMAL EFFLUENTS
Alberto E. Molini Aug. 1982 20 p refs Presented at the 1st Pan Am. Congr. on Energy and 2d Natl. Conf. on Renewable Energy Technol., San Juan, Puerto Rico, 1-7 Aug. 1982
(PB83-211227) Avail: NTIS HC A02/MF A01 CSCL 07D

Enthalpy is recovered as work from hot industrial effluents by the controlled expansion of liquids through convergent-divergent nozzles in true reaction turbines. For hot liquid effluents, the effluent itself serves as the working fluid. For gaseous effluents, a high boiling stable liquid is heated by the gas in a scrubbing tower and then the liquid is expanded as the work fluid. If the effluents contain undesirable levels of particulate pollutants, the liquid is cleaned before it is expanded. The results predicted when using both impulse and true reaction turbines are reported. Results predicted when using work fluids as glycerol, tricresyl phosphate, bi-phenyls, and silicone oils are presented. Cycle efficiencies as high as 26% are predicted as possible. GRA

N83-36994# Puerto Rico Univ., Mayaguez. Dept. of Chemical Engineering.
WORK FROM STEAM EXPANDED TO LOW QUALITY LEVELS
Alberto E. Molini Aug. 1982 19 p refs Presented at the 1st Pan Am. Congr. on Energy and 2d Natl. Conf. on Renewable Energy Technol., San Juan, Puerto Rico, 1-7 Aug. 1982
(PB83-211268) Avail: NTIS HC A02/MF A01 CSCL 10A

To improve the efficiency of steam engines, designers resorted to larger temperature differences between the heat source and the heat sink. A high temperature of approximately 1100 F, limited by the materials of construction, was soon reached. The heat sink is limited by the environment and mechanically to a large extent by the moisture level to which the work-fluid is expanded. Because of the close dimensional tolerances together with the inability to simultaneously remove the condensate, modern steam turbines are restricted to expansion cycles from super-heat to steam qualities of approximately 95%. Large losses of efficiency are experienced when expanding to lower steam qualities. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N83-36995# Texas A&M Univ., College Station. Coll. of Business Adminstration.
INFORMATION RICHNESS: A NEW APPROACH TO MANAGER-

IAL BEHAVIOR AND ORGANIZATION DESIGN
Richard L. Daft, Robert H. Lengel, and Ricky Griffin May 1983 73 p refs
(Contract N00014-83-C-0025; NR Proj. 170-950)
(AD-A128980; TR-ONR-DG-02) Avail: NTIS HC A04/MF A01 CSCL 05/2

This paper introduces the concept of information richness, and proposes three models of information processing. The models describe (1) manager information behavior, (2) organizational mechanisms for coping with equivocality from the environment, and (3) organizational mechanisms for internal coordination. Concepts developed by Weick (1979) and Galbraith (1973) are integrated into two information tasks: equivocality reduction and the processing of a sufficient amount of information. The premise of this paper is that the accomplishment of these information tasks and the ultimate success of the organization are related to the balance of information richness used in the organization. GRA

N83-36996# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Computer Science.
SCHEDULING MAINTENANCE OPERATIONS WHICH CAUSE AGE-DEPENDENT FAILURE RATE CHANGES
Behnam Ebrahimian and Leonard Shaw 1 Jun. 1983 123 p refs
(Contract N00014-75-C-0858)
(AD-A130076; Poly-EE/CS-83-002) Avail: NTIS HC A06/MF A01 CSCL 05/1

This report studies the optimization of schedules for maintenance or repairs, for repairable stochastically failing systems. The novelty here is that the failure rate after a maintenance operation is a function of the system's previously expended lifetime. This generalizes earlier work by others on the simpler case where the future failure rate depends on the number of previous repairs, but not on the times when they took place. Two major preventive strategies are considered: (1) age replacement or policy 1; (2) periodic replacement with minimal repair at failure or policy 2. GRA

N83-36997# Assistant Secretary of the Navy, Washington, D.C. Research Engineering and Systems.
DEPARTMENT OF THE NAVY RDT AND E MANAGEMENT GUIDE
Mar. 1983 270 p refs
(AD-A130067) Avail: SOD HC $6.00/MF A01 CSCL 05/1

The Department of the Navy RDT&E Management Guide was developed to aid both newcomers to RDT&E management and practicing journeymen. For newcomers, the Guide provides a means of rapid orientation in the Department of the Navy system for managing its RDT&E effort. For practicing RDT&E managers, the Guide is a quick source of general information and identifies directives containing detailed guidance. Author (GRA)

N83-36998# Naval Postgraduate School, Monterey, Calif.
DESIGN AND ANALYSIS OF A MULTI-BACKEND DATABASE SYSTEM FOR PERFORMANCE IMPROVEMENT, FUNCTIONALITY EXPANSION AND CAPACITY GROWTH, PART 3
David K. Hsiao and M. Jaishankar Menon Jun. 1983 120 p refs
(AD-A130119; NPS52-83-007-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 05/1

This is Part II of the design and analysis of a multiple back-end database management system, known as MDBS. This part consists of the remaining of four chapters of the design and analysis details. An implementation team is pursuing the instrumentation of MDBS as designed and analyzed in Parts 1 and 2. It is hoped that studies and testing of the experimental MDBS may be used to verify the authors' analytic and simulation findings on the MDBS design and performance. Author (GRA)

N83-36999# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.
HOW TO IMPLEMENT A SIMPLE BOUTING SYSTEM
John J. Bartholdi, III, Loren K. Platzman, R. Lee Collins, and William H. Warden, III Apr. 1983 34 p refs
(Contract N00014-83-K-0147)
(AD-A129884; PDRC-83-04) Avail: NTIS HC A03/MF A01 CSCL 05/1

This report explains how to implement a simple but effective routing system that will quickly determine (1) which locations should be visited by which delivery vehicles, and (2) in what sequence each vehicle should visit its assigned locations. The system uses only a map and two card files. It is easy to maintain and requires no additional clerical effort. The system is being used successfully by a large delivery organization in Atlanta. GRA

N83-37000# Air War Coll., Maxwell AFB, Ala.
INFORMATION OVERLOAD: THE ARMY'S FAILURE TO MANAGE A RESOURCE
Richard D. Whitsett 21 Apr. 1983 78 p refs
(AD-A129989) Avail: NTIS HC A05/MF A01 CSCL 05/1

Information is a valuable resource of Headquarters, Department of the Army (HQDA). This fact is evidenced by HQDA's extensive reporting requirements levied on the field, its many complex management information systems, and its large investment in data processing equipment, software, and personnel. In fact, the primary function of HQDA, as the major planning and resource management activity of the Army, is centered about the acquisition, distribution, processing, storage, use, and dissemination of information. This paper explores the Army's attempts to manage its information systems as a valuable resource; provides a historical perspective on the subject; examines the Army's present information management systems; and, supplies some insight on the future of information resource management in the Army. The paper concludes that in the past three decades the Army's top management has not been sincerely committed to the development of an Information Resource Management program. GRA

N83-37001# General Accounting Office, Washington, D. C. Mission Analysis and Systems Acquisition Div.
EVALUATION OF THE UNIT COST EXCEPTION REPORTS ON THE HIGH SPEED ANTI-RADIATION MISSILE
Frank C. Conahan 6 Jun. 1983 4 p
(AD-A129689; GAO/MASAD-83-29) Avail: NTIS HC A02/MF A01 CSCL 05/1

The High Speed Anti-Radiation Missile (HARM) is a joint Navy and Air Force program with the Navy designated lead service. Although a joint program, both services prepared unit cost exception reports. We reviewed four unit cost exception reports submitted by the Secretaries of the Navy and the Air Force explaining why unit costs for HARM increased. The reports submitted generally provided the unit cost information required by law. However, the reports did not present a complete picture of a joint Department of Defense program. Each service based its program estimates on different acquisition strategies even though only one strategy can be followed. In addition, the reports did not disclose other reasons contributing to the differences in unit costs or fully explain why costs increased. Since separate reports were submitted, they should have clearly disclosed all differences and any implication on costs. This review was made as part of our continuing examination of unit cost exception reports. GRA

N83-37002# ALPHATECH, Inc., Burlington, Mass.
ASYMPTOTIC AGREEMENT AMONG COMMUNICATING DECISION MAKERS
R. B. Washburn and D. Teneketzis 1983 7 p refs Presented at the Am. Control Conf., San Francisco, 22 Jun. 1983
(Contract DE-AC01-80RA-50418)
(DE83-014517; CONF-830628-6) Avail: NTIS HC A02/MF A01

Asymptotic agreement among communicating decision makers in terms of the evolution of a dynamical system defined on the lattice of information sigma algebras was studied. The approach focuses on the concept of decisions based on common knowledge, but it extends the investigation to general decision rules. Conditions for asymptotic agreement in cases of direct, indirect, and random communications are obtained. DOE

N83-37003# National Academy of Sciences - National Research Council, Washington, D. C. Board on Science and Technology for Internation Development.
PROCEEDINGS OF PANEL DISCUSSIONS ON SCIENCE AND TECHNOLOGY PLANNING AND FORECASTING FOR INDONESIA: SPECIAL EMPHASIS ON MANPOWER DEVELOPMENT
1983 150 p refs Discussions held at Jakarta, Indonesia, 8-10 Nov. 1982 Sponsored in part by Government of Indonesia Ministry of State for Research and Technology, Indonesian Inst. of Science and BOSTID
(Contract AID-497-79-100-23)
(PB83-191288) Avail: NTIS HC A07/MF A01 CSCL 05A

Continuing economic growth of Indonesia is leading to increasing demands on science and technology. The country's future development will depend heavily on its ability to use science and technology effectively to make the best use of natural resources. This task will be undertaken by broadening the scope of human activities and raising the quality of Indonesia's human resources. One of the roles of research, science and technology is to promote value-added processes and the creation of jobs through industrial development. With the benefit of science and technology, much progress has already been made during the first three 5-year development plans. Indonesia must increase significantly its output of trained personnel and improve the quality of their training with severe constraints on time and resources. Author (GRA)

N83-37004# Office of Technology Assessment, Washington, D.C.
AUTOMATION AND THE WORKPLACE: SELECTED LABOR, EDUCATION, AND TRAINING ISSUES
Mar. 1983 111 p refs
(PB83-191320; OTA-TM-CIT-25; LC-83-600508) Avail: NTIS HC A06/MF A01 CSCL 05A

The report examines the nature and development of automation technologies (such as robotics, computer-aided design and manufacturing, and automated materials handling, storage, and retrieval). The assessment also evaluates the structure and competitive conduct of industries producing and using programmable automation technologies. Finally, the implications of the production and use of programmable automation for labor and for education and training activities are examined. This Memorandum discusses procedures for evaluating potential employment change associated with automation, and outlines associated problems. It also provides descriptions of the nature and modes of delivery of education, training, and retraining for persons holding or seeking employment in manufacturing industries. Author (GRA)

N83-37005# National Academy of Sciences - National Research Council, Washington, D. C. Committee on the Institutional Means for Assessment of Risk to Public Health.
RISK ASSESSMENT IN THE FEDERAL GOVERNMENT: MANAGING THE PROCESS Final Report
1983 203 p refs
(Contract FDA-223-81-8251)
(PB83-191262; LC-83-80381; ISBN-0-309-03349-7) Avail: NTIS HC A10/MF A01 CSCL 06E

The Committee on Institutional Means for Assessment of Risks to Public Health was formed, in response to a congressional directive, to fulfill three primary objectives: (1) To assess the merits of separating the analytic functions of developing risk assessments from the regulatory functions of making policy decisions; (2) To consider the feasibility of designating a single organization to do risk assessments for all regulatory agencies; and (3) To consider the feasibility of developing uniform risk assessment guidelines for use by all regulatory agencies. Author (GRA)

N83-37006# National Science Foundation, Washington, D.C. Div. of Policy Research and Analysis.
PROCEEDINGS OF A WORKSHOP ON THE ROLE OF BASIC RESEARCH IN SCIENCE AND TECHNOLOGY: CASE STUDIES IN ENERGY R AND D (RESEARCH AND DEVELOPMENT)
1983 141 p Workshop held in Washington, D.C., 12-13 Mar. 1983
(PB83-213645; NSF-83-30; NSF/PRA-83012) Avail: NTIS HC A07/MF A01 CSCL 05A

Meanings of the term basic research are provided and a common definition is sought. The direct impact of basic research on the advancement of energy technology and science and the indirect benefits of that research to society in general are evaluated. Research programs at the Department of Energy and in private industry are examined. Characteristics of industries involved in research and development (R&D) are discussed. These industries are said to be large, diversified, multinational corporations that are highly affected by government regulation and that carry on their R&D in diversified locations. Industry and university interactions are discussed. GRA

N83-37007# General Accounting Office, Washington, D. C. Program Analysis Div.
THE FEDERAL ROLE IN FOSTERING UNIVERSITY-INDUSTRY COOPERATION
25 May 1983 68 p
(PB83-218008; GAO/PAD-83-22; B-210894) Avail: NTIS HC A04/MF A01 CSCL 05A

Closer links between universities and industry in research and education can enhance technological innovation. However, cooperative arrangements between them are difficult to create and sustain because of differences in missions, values, and rewards. GAO examined three well-known forms of university-industry collaboration--research parks, cooperative research centers, and industrial extension services--to develop information and guidelines to help policymakers in designing any new or revised Federal initiatives to stimulate cooperation. Each form of cooperation draws upon different strengths and resources of the participants and produces different outcomes. None is likely to succeed unless the participants possess the relevant strengths and mutual interests. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N83-37008 California Univ., San Francisco.
SPECIFICATIONS FOR INTERACTIVE INFORMATION SYSTEMS Ph.D. Thesis
Susan Karen Stinson 1982 265 p
Avail: Univ. Microfilms Order No. DA8304194

A methodology for the specification of interactive information systems is described and applied to a medical information system. The user software engineering (USE) specification methodology attempts to overcome a communication problem for the specific class interactive information systems. An interactive information system (IIS) provides computer-naive users with a means for conversational access to data stored within the system, typically through a predetermined set of operations. In this approach, the IIS structure consists of a data base, a set of operations and a user dialogue. Each transaction may carry out one or more operations and involves a dialogue between the user and the IIS. The specification model has two linked views of the system. The user view facilitates user participation in the analysis of the system requirements and in the definition of the user/system dialogue. The developer view supports design and testing of the resulting system. The notation combines an informal specification with a more formal approach using transition diagrams for the user interface, logical data base design methods for the data and a data manipulation language for describing the operations.
Dissert. Abstr.

N83-37009# University of Southern California, Marina del Rey. Information Sciences Inst.

THE ANATOMY OF A SYSTEMIC CHOICE Interim Report
William C. Mann Sep. 1982 28 p refs
(Contract F49620-79-C-0181; AF Proj. 2304)
(AD-A126354; AFOSR-83-0135TR) Avail: NTIS HC A03/MF A01 CSCL 05/7

A framework for expressing how choices are made in systemic grammars is presented. Formalizing the description of choice processes enriches descriptions of the syntax and semantics of languages, and it contributes to constructive models of language use. There are applications in education and computation. The framework represents the grammar as a combination of systemic syntactic description and explicit choice processes, called 'choice experts'. Choice experts communicate across the boundary of the grammar to its environment, exploring an external intention to communicate. The environment's answers lead to choices and thereby to creation of sentences and other units, tending to satisfy the intention to communicate. The experts' communicative framework includes an extension to the systemic notion of a function, in the direction of a more explicit semantics. Choice expert processes are presented in two notations, one informal and the other formal. The informal notation yields a grammar guided conversation in English between the grammar and its environment, while the formal notation yields complete accounts of what the grammar produces given a particular circumstance and intent.
Author

N83-37010# Cornell Univ., Ithaca, N.Y. College of Agriculture and Life Sciences.
INFORMATION ENGINEERING: ON-LINE ANALYSIS OF INFORMATION SEARCH AND UTILIZATION Technical Report, 1 Mar. - 31 May 1983
David E. Stone, Barbara A. Hutson, and Jim C. Fortune May 1983 40 p refs
(Contract N00014-80-C-0372; RR0420602)
(AD-A128997; TR-10-SER-B; TR-9) Avail: NTIS HC A03/MF A01 CSCL 05/2

This research is part of an ongoing effort to understand the processes people employ in reading technical material and the way in which information engineering can facilitate those processes. This study provided a detailed and hierarchically organized information structure as part of a computer-assisted job-aiding procedure for an assembly task. The central questions were: where people have easy access to many kinds of information what information do they select to help them do the job? How do people vary? How does information selectino differ across sites in the text and graphics? The results of this experiment provide preliminary answers to these questions and serve as the basis for our continuing research in this area. Author (GRA)

N83-37011# Space and Missile Test Center, Patrick AFB, Fla. Directorate of Contracting and Support.
ESMC (EASTERN SPACE AND MISSILE CENTER) HANDBOOK FOR SCIENTIFIC AND TECHNICAL INFORMATION (STINFO) Final Report
Linda M. Adams 1 Mar. 1983 32 p
(AD-A128960; ESMC-TR-83-1) Avail: NTIS HC A03/MF A01 CSCL 05/2

This report is a general reference guide for DOD, Air Force, and ESMC STINFO Programs. It is a compilation of material contained in pertinent STINFO regulations and manuals. It is designed to be used as a working guide for all managers and technical personnel serviced by ESMC STINFO. Author (GRA)

N83-37012# Advanced Information and Decision Systems, Mountain View, Calif.
THE INTELLIGENT PROGRAM EDITOR: A KNOWLEDGE BASED SYSTEM FOR SUPPORTING PROGRAM AND DOCUMENTATION MAINTENANCE
Daniel G. Shapior and Brian P. McCune Mar. 1983 9 p refs
(Contracts F49620-81-C-0067; F30602-80-C-0176; N00014-82-C-0119; AF Proj. 2304)
(AD-A129153; AFOSR-83-0488TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper presents work in progress towards a program development and maintenance aid called the Intelligent Program Editor (IPE), which applies artificial intelligence techniques to the task of manipulating and analyzing programs. The IPE is a knowledge based tool: it gains its power by explicitly representing textual, syntactic, and many of the semantic (meaning related) and pragmatic (application oriented) structures in programs. To demonstrate this approach, the authors implemented a subset of this knowledge base, and a search mechanism called the Program Reference Language (PRL), which is able to locate portions of programs based on a description provided by a user. This work is an applied research effort. It was motivated by issues discovered during a study of software maintenance problems in the Air Force, and is intended to be moved into application within seven years.
GRA

N83-37013# Computer Corp. of America, Cambridge, Mass. Man-Machine Interfaces Sect.
USS CARL VINSON SDMS (SPATIAL DATA MANAGEMENT SYSTEM) Final Report, 15 Jul. - 31 Dec. 1981
Christopher F. Herot, Jane Barnett, Richard Carling, Mark Friedell, David Kramlich, and Ronni L. Rosenberg Jun. 1983 36 p refs
(Contract N00038-81-C-0592; ARPA Order 3958)
(AD-A130125) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes the USS Carl Vinson application of Computer Corporation of America's (CAA's) Spatial Data Management System (SDMS) -- a unique, user interface that provides a simple and uniform means of accessing different kinds of computerized information. Work under the referenced contract consists of the design and partial implementation of this application. SDMS is a computer-based tool that uses graphical symbols to convey information. SDMS merges the visual power of symbols with the information-handling facilities of a conventional database management system (DBMS). It provides a highly effective means for people who are not data processing professionals to organize and access a database. Spatial data management is a technique for organizing and retrieving information by representing and positioning it graphically. Data are viewed through color displays. The displays show flat data surfaces on which pictorial representations of the data are arranged. The collection of all the data surfaces is called the graphical data space (GDS). The GDS consists of all the pictures that the user can access. SDMS automatically creates these pictures from data stored by the DBMS.
GRA

N83-37014# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
GEOTECHNICAL CONSTRUCTION CONTROL DATA BASE SYSTEM. USER'S MANUAL Final Report
Earl V. Edris, Jr., David P. Hammer, and Wipawi Vanadit-Ellis Apr. 1983 189 p refs
(AD-A130606; WES/IR/GL-83-1) Avail: NTIS HC A09/MF A01 CSCL 13/2

A data base system for storage, retrieval, and display of geotechnical construction control earthwork data for earth and rock-fill dams is described and detailed instructions for using the system are given with examples for actual projects. The data system is designed for field project quality control and quality assurance monitoring and rapid display of a variety of construction control data and preparation of reports required by Corps of Engineering (CE) guidance (EM 1110-2-1911, 'Construction Control for Earth and Rock-Fill Dams'). The system provides for easy, interactive data entry and editing with automatic data checks and user specified threshold values that produce warning messages when data exceeds the range of field compaction control criteria. Data storage and retrieval are accomplished using the CE owned SYSTEM 200 Data Base Management System on the Corps-wide Teleprocessing Procurement Service (TPS) operated (1983) by Boeing Computer Service (BCS). The data entry and retrieval programs developed for the data system are designed for a low skill level and minimum training of field project personnel. GRA

N83-37015# Armament Systems, Inc., Anaheim, Calif.
PROPOSAL AND JUSTIFICATION FOR THE ESTABLISHMENT OF AN AERONAUTICAL SYSTEMS-TARGET NONNUCLEAR SURVIVABILITY-VULNERABILITY INFORMATION ANALYSIS CENTER-SURVIAC Final Report
R. Bernier, D. Mowrer, and R. Horton Oct. 1982 153 p
(Contract N00123-80-D-0033)
(AD-A130414; JTCG/AS-82-SM-006) Avail: NTIS HC A08/MF A01 CSCL 05/2

This publication documents the results of a questionnaire/study to determine the need and justification for the establishment of a Department of Defense Information Analysis Center to collect, analyze, and disseminate scientific and technical information related to the survivability and vulnerability of aeronautical systems and other targets to nonnuclear threats. The report resulted in gaining approval for the SURVIAC. GRA

N83-37016# Illinois Univ., Urbana. Engineering-Psychology Research Lab.
A COMPARISON OF VERBAL AND GRAPHICAL INFORMATION PRESENTATION IN A COMPLEX INFORMATION INTEGRATION DECISION TASK
Christopher D. Wickens and Brad D. Scott Jun. 1983 49 p refs
(Contract N00014-79-C-0658; NR Proj. 196-158)
(AD-A130483; EPL-83-1/ONR-83-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

This report describes an experiment conducted to evaluate the relative merits of verbal as opposed to spatial-graphical display formats in presenting sequential information to subjects in a tactical decision making task. The task required subjects to integrate a series of information messages bearing on the likelihood that one of two hypotheses pertaining to tactical maneuvers was in effect. Each information source could vary in its diagnosticity and its reliability. These variables contribute independently to the total valence or information valence of the cue. Subjects integrated information in problems of either 6, 8, or 10 cues, presented at a slow or fast speed, in either a verbal (numerical) or spatial (graphical) format. After each problem, subjects made a choice of the most likely hypothesis accompanied by an analog judgment of their confidence in that choice. The results were examined from two perspective: (1) from the perspective of human engineering guidelines, the data indicated that subjects' decisions were more accurate using the spatial display. (2) The data for both displays were analyzed from the perspective of different models of probablistic information integration. GRA

N83-37017# California Univ., Berkeley. Lawrence Berkeley Lab. Electronics Research Lab.
CONCURRENT UPDATES AND RETRIEVAL IN DISTRIBUTED DATABASE SYSTEMS Final Report, 1 Jul. 1981 - 31 Dec. 1982
M. R. Stonebraker and E. Wong Jan. 1983 13 p refs
(Grant AF-AFOSR-3596-78; AF Proj. 2304)
(AD-A129529; AFOSR-83-0512TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

At its inception, this project was designed to represent a comprehensive program of research in the field of distributed database management. The problems to be dealt with were to include the three major topics in distributed database: query processing, concurrency control and crash recovery. In addition, the problem of interconnecting heterogeneous databases was also proposed. To a substantial extent, major progress has been achieved in all these areas. In this report a summary of the principal findings is presented. GRA

N83-37018# Office of Naval Research Liason Office, Far East, APO, San Francisco, Calif.
ONR FAR EAST SCIENTIFIC BULLETIN. VOLUME 8, NUMBER 2, APRIL TO JUNE 1983
Sachio Yamamoto and Mary Lou Moore, ed. Jun. 1983 92 p refs
(AD-A130670) Avail: NTIS HC A05/MF A01 CSCL 05/2

This is a quarterly publication presenting articles covering recent developments in Far Eastern (particularly Japanese) scientific research. It is hoped that these reports (which do not constitute part of the scientific literature) will prove to be of value to scientists by providing items of interest well in advance of the usual scientific publications. The articles are written primarily by members of the staff of ONR Far East, with certain reports also being contributed by visiting stateside scientists. Occasionally a regional scientist will be invited to submit an article covering his own work, considered to be of special interest. Author (GRA)

N83-37019# Department of Energy, Washington, D. C. Office of Energy Markets and End Use.
MODEL DOCUMENTATION: SHORT-TERM INTEGRATED FORECASTING SYSTEM DEMAND MODEL
Mark E. Rodekohr Mar. 1983 95 p refs
(DE83-011479; DOE/EIA-0391) Avail: NTIS HC A05/MF A01

The demand models used by the Short-term Integrated Forecasting System (STIFS) to produce the energy-demand forecasts published in the Short-Term Energy Outlook (Outlook) are documented. The STIFS demand model is a set of individual energy product demand models which, when combined with electric utility fuel use and natural gas supply and demand estimates, produces projections of demand for total energy and individual energy products. The geographical area of consideration is the United States, defined as the 50 States excluding the territories and islands. The model forecasts on a monthly basis but only quarterly averages are published. All forecasts are made six quarters into the future. The structure of the individual models is summarized, beginning with the energy price models which are used to produce forecasts of the various retail energy prices used in the demand models. Most of these models are econometric, estimated by ordinary least squares for the Cochrane-Orcutt procedure which corrects for autocorrelation. Since all of the models are deterministic, no solution algorithm is used. DOE

N83-37020# Office of Management and Budget, Washington, D.C.
MAJOR INFORMATION TECHNOLOGY SYSTEMS ACQUISITION PLANS OF FEDERAL EXECUTIVE AGENCIES, 1983-1988 Annual Report
Apr. 1983 342 p Prepared in cooperation with GSA
(PB83-182790) Avail: NTIS HC A15/MF A01 CSCL 05B

This document is a compilation of Federal executive agency plans for major acquisitions of informaton technology systems, facilities, and related services from FY 1983 through FY 1988. This document has been prepared by the Office of Management and Budget (OMB) in partial fulfillment of the responsibilities assigned by the Paperwork Reduction Act (44 U.S.C. 3503(3) (E)) to develop a five-year plan for meeting the automatic data processing and telecommunications needs of the Federal Government. Author (GRA)

N83-37021# Texas Univ. at Dallas, Richardson.
KEYWORD THESAURUS: A LIST OF TERMS AND CODES TO IDENTIFY AREAS OF INTEREST FOR RESEARCH AND OTHER TYPES OF SPONSORED PROGRAMS
J. A. Rodman 1982 37 p
(Grant NSF PLN-81-09429)
(PB83-211961; NSF-82-001) Avail: NTIS HC A03/MF A01 CSCL 05B

This list of key words begins with geographic terms which may either indicate the subject of research or the location in which the project is to take place. Included here are continents, hemispheres, islands and chains, oceans and seas, polar regions, nations of the world, economic/linguistic and political subdivisions, and regions of the United States. Other categories are agriculture/food sciences/foods; arts/humanities/cultural activities, including geography, history, creative writing and other disciplines; behavioral/social sciences, including criminology, psychology, and population studies; education, including higher ecucation and special education; engineering, including bioengineering, ceramic, chemical, civil, industrial, and mechanical engineering; health and safety; law; management/commerce; science and technology/

mathematics/computer science; and other, including housing, library science, and recreation and leisure studies. An alphabetical list of key words is provided. Author (GRA)

N83-37022# National Bureau of Standards, Washington, D.C.
PUBLICATIONS OF THE MECHANICAL PRODUCTION METROLOGY DIVISION, 1980 - 1982
Marilyn A. Cadoff May 1983 20 p
(PB83-208082; NBSIR-63-2699) Avail: NTIS HC A02/MF A01 CSCL 14B

This bibliography lists 147 publications of the Mechanical Production Metrology Division (Center for Manufacturing Engineering, National Engineering Laboratory) for calendar years 1980-1982. The Mechanical Production Metrology Division operates largely in the discipline of Applied Physics. It develops and maintains competence in engineering measurements and sensors, both static and dynamic, theoretical and experimental solid mechanics, generalized (optical and mechanical) wave inverse scattering, vibration analysis, acoustics research, and development of test methods, special tests, and calibrations of dynamic and static quantities including mass, force, acceleration, surface texture, acoustics, and optics. These competences are applied to problems in metrology, automated manufacturing, inspection technology to improve productivity, product quality, and occupational safety. The publications in this bibliography are listed under the following headings: micrometrology; surface topography; wave optics; force and mass; acoustics; vibration; acoustic emission; and ultrasonics. J.M.S.

N83-37023*# Henderson (Madeline M.), Bethesda, Md.
DATA ELEMENT DICTIONARY (DED): CONTAINS ALL PUBLIC DATA ELEMENTS USED IN THE MAJOR SYSTEMS FOR HANDLING FEDERAL GOVERNMENT SCIENTIFIC AND TECHNICAL REPORTS. DRAFT REPORT Special Publication
Madeline M. Henderson 1982 371 p Sponsored by NASA, Washington Prepared in cooperation with NTIS, Springfield, Va., DTIC, Alexandria, Va., DOE, Oak Ridge, Tenn., NASA STIF, BWI Airport, Md., and GPO, Washington, D.C.
(NASA-CR-174465; NAS 1.26:174465; PB83-215723; AD-A130300; NTIS/SP-83/01) Avail: NTIS HC A17/MF A01 CSCL 05B

All data elements, both substantive and housekeeping types, used in processing technical reports in each system are included in the compilation. Each record contains the elements' definition, rules for use, the tags or indicators used internally, and those used externally for information interchange. The data element dictionary (DED) is a useful tool for the participating agencies, allow for comparison of data elements as they differ from one system to another, of the rules set forth for the same or similar elements in the different systems, and of the tags or indicators used to identify the elements in exchange procedures. Users accessing the various systems, can consult the DED to assist in developing search strategies. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N83-37024# National Bureau of Standards, Washington, D.C. National Measurement Lab.
ECONOMIC EFFECTS OF FRACTURE IN THE US. PART 1: A SYNOPSIS OF THE SEPTEMBER 30, 1982 REPORT TO NBS BY BATTELLE COLUMBUS LABORATORIES Final Report
R. P. Reed, J. H. Smith, and B. W. Christ Mar. 1983 23 p refs 2 Vol.
(PB83-207522; NBS-SP-647-1; LC-83-600704) Avail: NTIS HC A02/MF A01 CSCL 05C

The National Bureau of Standards and Battelle Laboratories (Columbus) have completed a study to assess the costs of material fracture to the United States for the year 1978. This exhaustive assessment used the econometric input-output model to identify contributions from the entire U.S. economy. The study included all materials and all types of structures and included both fracture occurrence and fracture prevention costs. Author (GRA)

N83-37025# Battelle Columbus Labs., Ohio.
ECONOMIC EFFECTS OF FRACTURE IN THE US. PART 2: A REPORT TO NBS BY BATTELLE COLUMBUS LABORATORIES Final Report
J. J. Duga, W. H. Fisher, R. W. Buxbaum, A. R. Rosenfield, A. R. Buhr, E. J. Honton, and S. C. McMillan Mar. 1983 355 p refs 2 Vol.
(PB83-208751; NBS/SP-647-2; LC-83-600705) Avail: NTIS HC A16/MF A01 CSCL 05C

A study was conducted to determine the cost of material fracture in the U.S. economy and to identify means of reducing the cost. An Input/Output (I/O) model of the economy was used to assess the costs of fracture. Fracture costs were determined for all materials, all sectors of the economy, and all fracture modes. The costs were associated with both the occurrence of fracture and the prevention of fracture. The total cost of fracture was determined to be $99 billion (1978 dollars). Full application of presently known technology through technology transfer could reduce this amount by $29 billion. Further research in fracture related technology could reduce the cost of fracture another $23 billion. Author (GRA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N83-37026# General Accounting Office, Washington, D. C. General Government Div.
FREEDOM OF INFORMATION ACT OPERATIONS AT SIX DEPARTMENT OF JUSTICE UNITS. REPORT TO THE CHAIRMAN, SUBCOMMITTEE ON GOVERNMENT INFORMATION, JUSTICE AND AGRICULTURE, COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES
23 May 1983 18 p
(PB83-222356; GAO/GGD-83-64: B-211683) Avail: NTIS HC A02/MF A01 CSCL 05A

The Freedom of Information Act states that agencies have 10 days to respond to a request for information. In general, the six Department of Justice units GAO reviewed took longer than 10 days. Decentralized records, the volume of requested material, the need to carefully review sensitive records, and the resulting backlogs were the primary causes of delayed responses. Without completely automating or centralizing records or making responses a top Department priority, however, significant improvements in the timeliness of responses do not seem feasible. The report also discusses other FOIA issues of concern to the subcommittee. Author (GRA)

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N83-37027# National Electrical Engineering Research Inst., Pretoria (South Africa).
COMPARISON OF TWO TYPES OF BATTERY VEHICLE DRIVE SYSTEMS WITH REGARD TO THE ENERGY CONSUMPTION DURING START/STOP DRIVING CONDITIONS
H. R. vanNiekerk Mar. 1982 31 p refs

(CSIR-ELEK-238; ISBN-0-7988-17127) Avail: NTIS HC A03/MF A01

The results of calculations done on the energy consumption of multiple ratio and fixed ratio drive systems under operating conditions typical of town use are provided. N.W.

N83-37028*# General Motors Corp., Indianapolis, Ind.
CERAMIC APPLICATIONS IN TURBINE ENGINES Progress Report, 1 Jul. - 31 Dec. 1980
Joseph A. Byrd, Michael A. Janovicz, and Samuel R. Thrasher Sep. 1981 165 p
(Contract DEN3-17)
(NASA-CR-165494; DOE/NASA/0017-3; NAS 1.26:165494; DDA-EDR-10672) Avail: NTIS HC A08/MF A01 CSCL 21E

Development testing activities on the 1900 F-configuration ceramic parts were completed, 2070 F-configuration ceramic component rig and engine testing was initiated, and the conceptual design for the 2265 F-configuration engine was identified. Fabrication of the 2070 F-configuration ceramic parts continued, along with burner rig development testing of the 2070 F-configuration metal combustor in preparation for 1132 C (2070 F) qualification test conditions. Shakedown testing of the hot engine simulator (HES) rig was also completed in preparation for testing of a spin rig-qualified ceramic-bladed rotor assembly at 1132 C (2070 F) test conditions. Concurrently, ceramics from new sources and alternate materials continued to be evaluated, and fabrication of 2070 F-configuration ceramic component from these new sources continued. Cold spin testing of the criatical 2070 F-configuration blade continued in the spin test rig to qualify a set of ceramic blades at 117% engine speed for the gasifier turbine rotor. Rig testing of the ceramic-bladed gasifier turbine rotor assembly at 108% engine speed was also performed, which resulted in the failure of one blade. The new three-piece hot seal with the nickel oxide/calcium fluoride wearface composition was qualified in the regenerator rig and introduced to engine operation wiwth marginal success. N.W.

N83-37029# Committee on Education and Labor (U. S. House).
NEW TECHNOLOGY IN THE AMERICAN WORKPLACE
Washington GPO 1983 260 p Hearing before the Subcomm. on Labor Std. of the Comm. on Educ. and Labor, 97th Congr., 2d Sess., 23 Jun. 1982
(GPO-11-510) Avail: Subcommittee on Labor Standards

The impact of automation on employment and the workplace is discussed to provide insight into the role of the Federal Government in encouraging productivity growth through technological change while protecting the rights and interests of workers. Major issues considered include automation and robotry; education and job training; occupational health concerns; income and retirement policies; job security; the effects of tax incentives; and the impact of technological change on women workers. Implications for labor management relations are included. A.R.H.

N83-37030# Vought Corp., Dallas, Tex.
COLD WEATHER TRANSIT TECHNOLOGY PROGRAM. VOLUME 3: INVESTIGATION OF THE HIGH INCIDENCE OF RAIL PULL APARTS ON CONTINUOUS WELDED RAIL Final Report
Y. J. Elizondo and R. E. Duvall May 1983 163 p refs
(PB83-218263; UMTA-IN-06-0009-83-3-Vol-3) Avail: NTIS HC A08/MF A01 CSCL 13F

This report presents the results of an investigation of the high incidence of rail pull apart failures on continuous welded rail occurring on the Massachusetts Bay Transit Authority's rapid transit system during the winter of 1981-1982. The investigation was accomplished as part of the Cold Weather Transit Technology (CWTT) program under a Federal grant from the Urban Mass Transportation Administration (UMTA) to the University of Notre Dame. The objective of the CWTT program is to improve transit operations in severe ice, snow, and cold environments. The rail pull apart investigation was made to determine the probable cause for the increased failure rate and to recommend corrective actions to prevent or reduce recurrence of the problem. The results were evaluated to confirm the conclusions reached during the second phase and to define process and/or operational limits required for corrective actions. Author (GRA)

N83-37031# Vought Corp., Dallas, Tex.
COLD WEATHER TRANSIT TECHNOLOGY PROGRAM. VOLUME 2: TRANSIT SYSTEM SURVEY Final Report
W. C. Albach, B. L. Koonce, and D. G. Randolph, Jr. May 1983 30 p Sponsored in part by Notre Dame Univ.
(PB83-219527; UMTA-IN-06-0009-83-2-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 13F

This report is one of a series of reports associated with the Cold Weather Transit Technology (CWTT) Program being implemented by the Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation. This report documents the findings of a survey made to determine the extent and nature of cold weather problems that affect mass transit systems. And covers the culd weather problems experienced by bus and rail transit systems. Author (GRA)

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N83-37032 Virginia Univ., Charlottesville.
RADIO OBSERVATIONS OF LUMINOSITY AND FLUX-MATCHED SAMPLES OF QUASI STELLAR OBJECTS Ph.D. Thesis
Susan Gale Neff 1982 176 p
Avail: Univ. Microfilms Order No. DA8228629

The VLA and the U.S. VLBI network were used to study 60 radio-loud quasars which were divided by redshift into three groups in such a way that comparisons were possible between two luminosity-independent samples and two flux-independent samples. The low redshift, low luminosity sample was found to differ more from the medium and high redshift groups than the latter two were found to differ from one another. Source properties that correlate with redshift include both angular and linear size, core dominance, and magnetic field density. Corrections for non-uniform optical depths and for Malmquist bias yield a plausible Hubble diagram that is consistent with qo of 0.2 (although values as large as 1.0 cannot be excluded) and that indicates steep evolution in quasar brightness. A large fraction of the low luminosity, low redshift ($z < 1.0$) quasars were found to contain jets that are similar to those seen in nearby bright radio galaxies. There is poor agreement between the VLA structure and the VLBI structure when the latter is observed. Implications for various radio source models are discussed. Dissert. Abstr.

N83-37033 Northwestern Univ., Evanston, Ill.
AN X-RAY SURVEY OF CLUSTERS OF GALAXIES Ph.D. Thesis
Michael Paul Kowalski 1982 435 p
Avail: Univ. Microfilms Order No. DA8305493

The X-ray properties of clusters of galaxies are investigated. The data were taken by the A-1 experiment aboard the HEAO 1 satellite in the 0.5 to 20 keV energy band. All clusters in both the Abell catalog and Duus and Newell southern cluster catalog were examined. An error box or an explicit upper limit was obtained for every cluster. The appendices present extensive lists of the survey results. A complete discussion of the reduction and analysis procedure is given. Supporting optical data (morphological classifications and redshifts) were obtained from the literature and

included in the appendices. Each cluster in both catalogs has an estimated or measured redshift. Redshift measurements of cluster galaxies were obtained at Kitt Peak National Observatory. A complete description of these observations with the 2.1 meter telescope is given. A statistical subset of the southern catalog was defined, making it possible to combine the Abell and Southern catalogs, and thereby take advantage of the large data base afforded by the combined catalogs. Dissert. Abstr.

N83-37034 Oklahoma State Univ., Stillwater.
A STUDY OF THE RADIATION PROCESS OF PULSARS Ph.D. Thesis
David James Gordon 1982 113 p
Avail: Univ. Microfilms Order No. DA8304861

A review of the present theories concerning the condition of the magnetosphere surrounding pulsars is given. The current theories for the radiation mechanisms are presented. The radiation mechanism of linear acceleration of electrons along the pulsar's magnetic field lines is singled out as probable contributor to the observed radiation. The spectral and angular distribution of the radiation is calculated using the Lienard-Wiechert theory and fast Fourier transform. The radiative transfer process for a cold plasma moving at relativistic speeds parallel to a steady state magnetic field is studied. The expressions for the cutoff frequencies and resonant frequencies are found and evaluated for the physical conditions thought to exist in the pulsar's magnetosphere. The shock wave mechanism for producing coherence of radiation is discussed. The existence of shocks in the supersonic plasma flowing along the magnetic field lines is studied and the thickness of the shock front is calculated. Dissert. Abstr.

N83-37035*# Stanford Univ., Calif. Dept. of Electrical Engineering.
CONTINUED DEVELOPMENT OF THE RADIO SCIENCE TECHNIQUE AS A TOOL FOR PLANETARY AND SOLAR SYSTEM EXPLORATION Final Report
1983 77 p
(Contract NAGw-326)
(NASA-CR-173072; NAS 1.26:173072) Avail: NTIS HC A05/MF A01 CSCL 03A

A possible alternative to a spacecraft monostatic radar system for surface studies of Titan is introduced. The results of a short study of the characteristics of a bistatic radar investigation of Titan's surface, presented in terms of the Voyager 1 flyby and a proposed Galileo orbiter of Saturn are outlined. The critical factors which need to be addressed in order to optimize the radio occultation technique for the study of clouds and cloud regions in planetary atmospheres are outlined. Potential improvements in the techniques for measuring small-scale structures in planetary atmospheres and ionospheres are addressed. The development of a technique for vastly improving the radial resolution from the radio occultation measurements of the rings of Saturn is discussed. N.W.

N83-37036*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVIDENCE FOR VARIABILITY OF THE HARD X-RAY FEATURE IN THE HERCULES X-1 ENERGY SPECTRUM
J. Tueller, T. L. Cline, B. J. Teegarden, W. S. Paciesas, D. Boclet, Ph. Durochoux, J. M. Hameury, N. Prantzos, and R. C. Haymes Aug. 1983 31 p refs Submitted for publication
(NASA-TM-85099; NAS 1.15:85099) Avail: NTIS HC A03/MF A01 CSCL 03A

The hard X-ray spectrum of HER X-1 was measured for the first time with a high resolution (1.4 keV FWHM) germanium spectrometer. The observation was performed near the peak of the on-state in the 35 day cycle and the 1.24 pulsations were observed between the energies of 20 keV and 70 keV. The feature corresponds to an excess of 7.5 sigma over the low energy continuum. Smooth continuum models are poor fits to the entire energy range (chance probabilities of 2 percent or less). The best fit energies are 35 keV for an absorption line and 39 keV for an emission line. These are significantly lower energies than those derived from previous experiments. A direct comparison of our data with the results of the MPI/AIT group shows statistically significant variations which strongly suggest variability in the source. Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N83-37037 Virginia Univ., Charlottesville.
ELLIPTICAL GALAXIES ASSOCIATED WITH EXTENDED RADIO SOURCES Ph.D. Thesis
Kerry Andrew Kingham 1982 166 p
Avail: Univ. Microfilms Order No. DA8301470

Both 79E and SO galaxies with radio emission was surveyed to study the central regions of these galaxies with high quality plate material with sufficient plate scale (15 in./mm) in order to correlate optical and radio features. An average of 0.84 + or - 0.33 companions closer than 50 kpc to the primary were found for galaxies in the sample. This is significantly more than the value of 0.11 + or - 0.42 found by Bothun and Sullivan for a sample of isolated and mostly nonradio ellipticals, it is more in agreement with Holmberg's (1969) value of 1.08 + or - 0.32 for a sample of spiral galaxies. This may indicate a connection between companions and radio sources in ellipticals. These companions seem to be aligned with the major axis of the primary galaxies. This alignment is strongest for the closest companions and for the most elongated galaxies. Three dust lanes were detected. The dust lanes in otherwise normal E galaxies associated with double radio sources were primarily found perpendicular to the radio axis. The radio optical axes alignment distribution was found to be random. Dissert. Abstr.

N83-37038 Wisconsin Univ., Madison.
SPATIAL STRUCTURE OF THE DIFFUSE SOFT X-RAY BACKGROUND Ph.D. Thesis
David Nelson Burrows 1982 484 p
Avail: Univ. Microfilms Order No. DA8301854

Data from the ten sounding rocket flights of the Wisconsin soft X-ray sky survey are presented in the form of maps of the sky in galactic coordinates in seven independent energy bands, with coverage of > 98% of the sky. Final experimental calibrations and interflight normalizations are included. Features in the X-ray maps are discussed, and the spatial structure in the B(0.1.0. 188keV), C(0.15.0.284 keV) and M(0.46.1.17keV) bands is analyzed. The structure in the B and C bands is probably not due to absorption by neutral gas of X-rays produced in a galactic halo. There is no evidence of an X-ray emitting galactic halo in the M band, either. The structure of the X-ray sky at energies between 0.1 and 1.0 keV is shown to be consistent with production by a combination of steller X-ray emission; supernova (SN) cavities, including the one surrounding the Sun; and an extrapolation of the high energy diffuse background. The B and C band X-rays are produced almost entirely in the local SN cavity. Dissert. Abstr.

N83-37039# Texas Univ., Austin. Center for Particle Theory.
POSSIBLE CIRCUMVENTION OF PARKER'S BOUND ON GALACTIC MAGNETIC MONOPOLES
Duane A. Dicus and Vigdor L. Teplitz (US Arms Control and Disarmament Agency, Washington, D.C.) Apr. 1983 8 p refs Prepared in cooperation with Maryland Univ., College Park
(Contract DE-AS05-76ER-03992)
(DE83-012932; DOE/ER-03992/515) Avail: NTIS HC A02/MF A01

The possibility that a magnetic monople was observed is presented. The monopole density appears to violate bounds on the density of such particles derived from the total mass density of the universe and from the existence of galactic magnetic fields. It is shown that the observation is not inconsistent with these bounds if the monopoles and antimonopoles are bound into positronium, like states with principal quantum-n high enough so

that the Earth's magnetic field will break them apart but small enough so that the weaker galacitc mangetic field will not. A range of values for n and is determined and it is shown that lifetimes for such bound states are longer than the current age of the universe. DOE

N83-37040# Texas Univ., Austin. Center for Particle Theory.
SPONTANEOUS LEPTON-NUMBER VIOLATION AND DE-LEPTONIZATION IN STELLAR COLLAPSE
Duane A. Dicus, Edward W. Kolb (Los Alamos National Lab.), and David L. Tubbs (Los Alamos National Lab.) Dec. 1982 17 p refs
(Contract DE-AS05-76ER-03992)
(DE83-012930; DOE/ER-03992/506) Avail: NTIS HC A02/MF A01

Core collapse in weak interaction models where global lepton number invariance is spontaneously broken was considered. It is found that the initial neutrino number prevents finite temperature restoration of lepton number conservation. Assuming the lepton number violating reactions occur rapidly it is shown that the neutrino number is driven to a sufficiently small value to allow electron capture reactions to deleptonize the core, and lead to a high entropy collapse. DOE

N83-37041# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Physical Sciences, Mathematics, and Resources.
ASTRONOMY AND ASTROPHYSICS FOR THE 1980'S. VOLUME 2: REPORTS OF THE PANELS
1983 463 p refs
(PB83-203992; ISBN-0-309-03334-9; LC-82-8014) Avail: NTIS HC A20/MF A01 CSCL 03B

Recommendation for programs and facilities needed to meet the opportunities for progress in astronomical research during the 1980's were made. Panels of experts were organized to propose recommendations in six areas of astronomical research. The panels studied observational programs in high energy astrophysics (including X-rays and gamma rays, as well as high energy neutrinos and gravitational waves); in ultraviolet, optical, and infrared astronomy (including radiation ranging from a few hundred angstrons to a few hundred micrometers wavelength); and in radio astronomy. A fourth panel addressed problems in the area of theoretical and laboratory astrophysics. A fifth panel, on data processing and computational facilities, addressed the utilization of computers for data reduction and analysis as well as for theoretical modelling. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N83-37042*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
CHORUS-RELATED ELECTROSTATIC BURSTS AT JUPITER AND SATURN Progress Report
L. A. Reinleitner, W. S. Kurth, and D. A. Gurnett 18 May 1983 42 p refs Submitted for publication
(Contract JPL-954013; Grants NAGw-337; NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-172851; NAS 1.26:172851; AD-A129921; U-of-IOWA-83-14) Avail: NTIS HC A03/MF A01 CSCL 04A

Analyses of the wideband plasma wave data obtained by Voyagers 1 and 2 at Jupiter and Saturn have revealed electrostatic bursts similar to those recently discovered at Earth in association with whistler-mode chorus. In all three magnetospheres the bursts are characterized by sporadic emissions near or slightly below the electron plasma frequency with bandwidths ranging from 10% to more than 50% of the center frequency. The events found at Jupiter occur in the middle magnetosphere during both the dayside as well as the early morning passes. At Saturn, the bursts occurred in the outer regions of the magnetosphere during the dayside pass. In each of the events analyzed, evidence exists for modulation of the electrostatic bursts by a low frequency wave, presumably chorus. One of the observations gained at Jupiter includes the detection of a low-frequency band at the proper frequency for chorus. Detailed waveform analysis confirms that this band does, indeed, modulate the electrostatic bursts. Based on the present understanding of the terrestrial observations it is believed that the electrostatic bursts are generated by an electron beam trapped in Landau resonance with the chorus. Author (GRA)

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N83-37043 California Univ., San Diego.
A STATIC MODEL OF CHROMOSPHERIC HEATING IN SOLAR FLARES Ph.D. Thesis
Paul Joseph Ricchiazzi 1982 187 p
Avail: Univ. Microfilms Order No. DA8305025

The response of the solar chromosphere to a long lived flux of nonthermal electrons was modeled of steady state energy balance, radiative transfer, and atomic statistical equilibrium are solved simultaneously by finite difference methods, using linearization and iteration. A semiempirical chromospheric model is assumed as the preflare state. The ambient preflare energy input per atom is deduced from the preflare temperature structure and does not change during the flare heating process. The structure of these chromospheric flare atmospheres shows the difference between the effects of thermal conduction and nonthermal electrons. Only nonthermal electrons cause significant heating below the flare transition region, in the remaining flare chromosphere. Collisional ionization by nonthermal electrons produces noticeable effects on the ionization low in the chromosphere. This, combined with the heating effects of the nonthermal electrons influences the temperature and density there. Dissert. Abstr.

N83-37044*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STATISTICAL ASPECTS OF THE 1980 SOLAR FLARES. PART 3: PARAMETRIC COMPARISON AND FINAL COMMENTS
Robert M Wilson Apr. 1983 33 p refs
(NASA-TM-82526; NAS 1.15:82526) Avail: NTIS HC A03/MF A01 CSCL 03B

The 1349 study flares are considered addressing relationships between pairs of specific study paremeters; namely, H alpha rise time versus H alpha importance, X-ray class and H alpha decay time; H alpha decay time versus H alpha importance and X-ray class; and H alpha importance versus X-ray class. Mean H alpha rise time and decay time versus X-ray class and H alpha importance will also be discussed, and some final comments regarding the study flares are given. N.W.

N83-37045*# Neilsen Engineering and Research, Inc., Mountain View, Calif.
DEVELOPMENT OF A COMPUTATIONAL MODEL FOR PREDICTING SOLAR WIND FLOWS PAST NONMAGNETIC TERRESTRIAL PLANETS Final Report, Jul. 1978 - Aug. 1983
Stephen S. Stahara and John R. Spreiter Oct. 1983 149 p refs
(Contract NASw-3182; Grant NSF ATM-82-10691)
(NASA-CR-174455; NAS 1.26:174455; NEAR-TR-313) Avail: NTIS HC A07/MF A01 CSCL 03B

A computational model for the determination of the detailed plasma and magnetic field properties of the global interaction of the solar wind with nonmagnetic terrestrial planetary obstacles is described. The theoretical method is based on an established single fluid, steady, dissipationless, magnetohydrodynamic contin-

uum model, and is appropriate for the calculation of supersonic, super-Alfvenic solar wind flow past terrestrial ionospheres. Author

N83-37046# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
MAGNETOHYDRODYNAMIC MODELLING OF INTERPLANETARY DISTURBANCES BETWEEN THE SUN AND EARTH
M. Dryer and S. T. Wu 21 Dec. 1982 50 p refs Sponsored in part by NOAA
(AF Proj. 4643)
(AD-A130115; AFGL-TR-82-0396; AFGL-ERP-816) Avail: NTIS HC A03/MF A01 CSCL 04/1

A time-dependent, nonplanar, two dimensional (2-D) magnetohydrodynamic computer simulation model is used to simulate a series of solar flare-generated shock waves and their subsequent disturbances in interplanetary space between the Sun and the Earth's magnetosphere. The canonical or anzatz series of shock waves include initial velocities near the sun over the range 500 to 3000 km/sec. The ambient solar wind, through which the shocks propagate, is taken to be a steady-state flow that is independent of heliolongitude; its radial dependency consists of a representative set of plasma and magnetic field parameters which will be presented. Particular attention is directed to the MHD model's ability to address fundamental operational questions regarding the long-range forecasting of geomagnetic disturbances. These questions are: (1) will a disturbance (such as the present canonical series of solar flare shock waves) produce a magnetospheric and ionospheric disturbance, and, if so; (2) when wil it start; (3) how severe will it be; and (4) how long will it last? The model's output is used to compute various solar wind indices of current interest for this purpose. It is concluded that future work should be focused on a cohesive updating of, for example, daily measured solar parameters as input for the model whose output should be compared with spacecraft data for specific events. Author (GRA)

N83-37047# TRW Defense and Space Systems Group, Redondo Beach, Calif. Space Sciences Dept.
A PROJECT TO DEVELOP AN INDEX OF PC 3, 4, 5 GEOMAGNETIC PULSATIONS AND TO STUDY THEIR CONTROL BY SOLAR WIND PARAMETERS Final Report
Eugene W. Greenstadt Apr. 1983 83 p refs
(Contract F49620-81-C-0003; AF Proj. 2311)
(AD-A130135; TRW-36116-6006-UT-00; AFOSR-83-0575TR) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report summarizes the recent activities and results of a study seeking to discover and quantify the relationship between solar wind parameters, magnetosheath turbulence, and daytime geomagnetic pulsations. The most significant achievement has been a major advance in data processing and computational analysis leading to the first observations and measurements of magnetospheric resonance thickness, wave transfer across the magnetopause, and wave structure in the outer magnetosheath. Author (GRA)

N83-37048# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 462, PART 2. COMPREHENSIVE REPORTS, DATA FOR AUGUST 1982 - AUGUST 1980 AND MISELLANEA
Feb. 1983 98 p
(PB83-190694; NOAA-83040502) Avail: NTIS HC A05/MF A01 CSCL 03B

Solar radio emission; solar X-ray radiation; and mass ejections from the Sun are discussed. Author (GRA)

N83-37049# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
STUDIES OF SOLAR Ca K PLAGE AND UV, X-RAY AND 10 cm VARIATIONS
Lawrence C. Puga and Richard F. Donnelly Sep. 1982 47 p refs
(PB83-186163; NOAA-TM-ERL-SEL-65; NOAA-83032403) Avail: NTIS HC A03/MF A01 CSCL 03B

The literature about Ca K plages is briefly reviewed with with particular emphasis on the statistics of plage lifetimes, areas, and intensities. Inconsistencies among reports of Ca K plage data were examined and occasional problems found. Plage area is shown to be correlated to the associated sunspot area but the relation includes appreciable scatter. Estimates of the solar 1 - 8A X-ray flux based on Ca K plage data are shown to be more accurate than those based on the 10.7 cm radio flux. Daily means of the solar soft X-ray flux observed primarily from the SMS-2 satellites are presented for 1975-1976. The quality factor for solar soft X-ray data are presented for 1975-1980. Author (GRA)

N83-37050# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 463, MARCH 1983. PART 1: (PROMPT REPORTS). DATA FOR FEBRUARY 1983, JANUARY 1983 AND LATE DATA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 462 (SUPPLEMENT) FEBRUARY 1983
Helen E. Coffey, ed. May 1983 116 p 3 Vol.
(PB83-216309; SGD-463-Pt-1; NOAA-83060806-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 03B

Contents: alert periods; daily solar indices; solar flares; solar radio emission; inferred interplanetary magnetic field polarities; man solar magnetic field; daily solar activity centers; sudden ionospheric disturbances; cosmic rays; geomagnetic indices; and radio propagation indices. GRA

N83-37051# National Center for Atmospheric Research, Boulder, Colo.
THE WHITE LIGHT SOLAR CORONA: AN ATLAS OF K-CORONAMETER SYNOPTIC CHARTS, DECEMBER 1981 - JANUARY 1983
K. Rock, R. Fisher, C. Garcia, P. Seagraves, and E. Yasukawa Feb. 1983 45 p
(Grant NSF ISP-82-17015)
(PB83-216036; NAR/TN-205) Avail: NTIS HC A03/MF A01 CSCL 03B

A synoptic observing program continued at the Mauna Loa Solar Observatory, a site operated by the High Altitude Observatory to study the solar corona using the Mark III K-Coronameter. Daily pB images were used to extract three pB(phi) azimuthal scans located at three different heights. Two final data products are given in this atlas: (1) interpolated pB contour plots for 2 values of H for each Carrington rotation, and (2) shaded pB charts for each Carrington rotation. Author (GRA)

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N83-37052# Los Alamos Scientific Lab., N. Mex.
ISOTROPY OF ULTRA-HIGH-ENERGY COSMIC RAYS AND MULTIPLE SUPERNOVA 1 GALACTIC SOURCE
Stirling A. Colgate 7 Apr. 1983 4 p refs Presented at the 18th Intern. Cosmic Ray Conf., Bangalore, India, 22 Aug. - 3 Sep. 1983
(Contract W-7405-eng-36)
(DE83-011319; LA-UR-83-1049; CONF-830830-1) Avail: NTIS HC A02/MF A01

Ultrahigh energy cosmic ray which are usually associated with an extragalactic origin. Active galactic nuclei are an unlikely source because of photon drag. Here the possibility of supernova events are considered. The time spread of arrival of 10(2)0 eV protons is 100 to 400 years at 10 to 20 kpc and the angular spread is +-15 to +-300 depending upon the Galactic field configuration. The

time spread is sufficient to include several to a dozen type I SN. This is enough events and angular spread to include the observed data. The concentration of the observed events at the galactic poles is contradictory. The flux is reasonable if the observed flux and slope at 10(12) to 10(15) eV is characteristic of the source(s) and confined at this energy for roughly 100 traversals of the Galaxy, or 3 x 10(6) years. DOE

99 GENERAL

N83-37053# Office of Naval Research Liason Office, Far East, APO, San Francisco, Calif.

ONR FAR EAST SCIENTIFIC BULLETIN, VOLUME 8, NO. 1, JANUARY - MARCH 1983

Sachio Yamamoto and Mary Lou Moore Mar. 1983 135 p (AD-A129602; NAVSO-P-3580-Vol-8-No-1) Avail: NTIS HC A07/MF A01 CSCL 05/2

This is a quarterly publication presenting articles covering recent developments in East Asian (particularly Japanese) scientific research. It is hoped that these reports (which do not constitute part of the scientific literature) will prove to be of value to scientists by providing items of interest well in advance of the usual scientific publications. The articles are written primarily by members of the staff of ONR Far East, with certain reports also being contributed by visiting stateside scientists. Occasionally a regional scientist will be invited to submit an article covering his own work, considered to be of special interest. Author (GRA)

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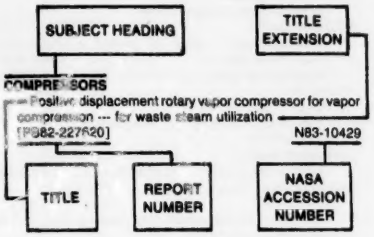

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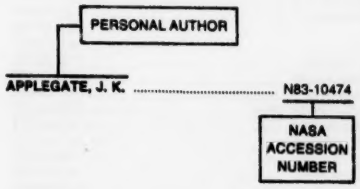

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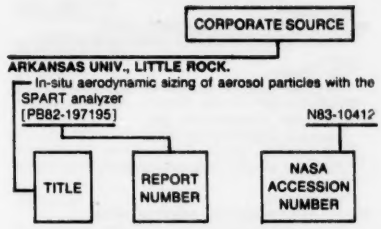

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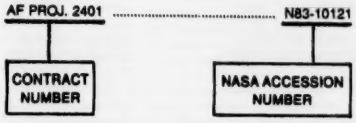

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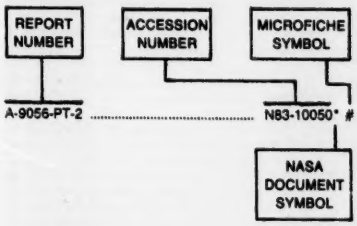

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